

THE
Psychological Review

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THE PSYCHOLOGICAL REVIEW.

IMAGELESS THOUGHT¹

BY JAMES ROWLAND ANGELL

University of Chicago

I

The problem of imageless thought has taken two main forms in current discussion. One of these has to do with the analysis of the reflective consciousness and with the exhaustive description of the contents of the mind distinguishable in such thinking. It is alleged, for example, by one considerable party of psychologists that a good deal of our thinking goes on without the presence of any discernible images at all. There is, in the second place, as a subordinate form of the problem, the doctrine that voluntary action requires for its initiation the presence of neither sensations nor images, and that it may be carried on as the consequence of a 'pure thought.' Clearly, this second form of the problem is essentially a corollary to the first form, inasmuch as the existence of such imageless thought is, in the nature of the case, a question prior to the use of such thought to control conduct.

Partly owing to a discussion carried on in the pages of the *Philosophical Review* with Professor Stout, the editor of *Mind*, and partly as the result of certain statements in the writer's 'Psychology,' his name has been involved in the controversies which have raged on this subject in contemporary literature. Up to the present time the author has held his peace in the face of the attacks to which he has been subjected by the defenders of imageless thinking. This occasion seems an appro-

¹An address delivered at Columbia University, February 3, 1911.

priate one, however, upon which to initiate a counter attack. This course is particularly justified in view of the rapidly increasing literature on the experimental psychology of the thought processes, in connection with which the issue involved in the imageless thought doctrine is peculiarly important.

We shall address ourselves first to the question of the sheer existence of imageless thought and devote such time as may remain to a briefer consideration of the utilization of thought material of this kind in the control of voluntary action. It will perhaps serve to clear the ground in a helpful way if we turn back to the first explicit discussions of this question in our English literature of the subject, and see how the case stands. This is especially desirable in view of the persistent errors of citation, as they appear to the writer, rife among the defenders of imageless thought and even among its critics. Stout, for example, has been repeatedly cited as an advocate of imageless thought, despite his explicit disclaimer of entertaining under that rubric a doctrine such as certain of its advocates attribute to him.

The present author, in reviewing Stout's 'Analytic Psychology,' had called attention to the fact that imageless thought was put forward in that treatise as not only intelligible, but actual. Following this review, the author wrote a brief paper on the subject at issue, to which Stout himself replied in a subsequent number of the same journal.¹

Stout's original statement had been as follows:

"An imageless thought is no absurdity. . . . There is no absurdity in supposing a mode of presentational consciousness which is not composed of visual, auditory, tactual, and other experiences, derived from, and in some degree resembling in quality, the sensation of the special sense. . . ." ('Analytic Psychology,' Vol. I., p. 85.)

This seemed to be a sufficiently unequivocal statement and the present writer entered upon his critique, assuming that Stout really meant what he seemed to say, namely, that we have particular moments of thought in which no imagery and no sensational material is to be discovered. In the reply which Stout wrote to this article he made it quite clear that the doctrine which he advocated was in no sense

¹ *Phil. Rev.*, VI., 1897, p. 532, p. 646; Vol. VII., 1898, p. 72.

interpretable as the author had done. The ambiguity seems to attach to the word 'mode' in the passage quoted, which Stout apparently used as equivalent to the word 'phase,' whereas the reviewer had regarded it as equivalent to 'form,' or 'moment.' Stout said, for example:

"It will be said that in all such cases the presence of some specific item of sensation is necessary, and that similarly, in higher processes, the presence of some specific image is necessary. Now I do not feel sure that this is absolutely and always true. But I have no desire to contest the point. Certainly if imageless apprehension occurs otherwise than as apprehension of the meaning of a given sensation or image, it must be admitted that it plays no important part in our mental life. What I am concerned to maintain is that apprehension of meaning is a specific mode of consciousness, and that it cannot be resolved into the presence of sensation or image to which the meaning attaches. . . . I am inclined to believe that Professor Angell's criticism is largely due to his supposition that when I speak of imageless apprehension, I have in view a total state of consciousness, rather than a partial constituent of a total state, which contains as another constituent some sensation or image. What I am really concerned to deny is that when A means B for consciousness, it does so by actually recalling an image of B; and that when no image is recalled, it can mean B only in the sense of being substituted for it."

This statement would seem to be sufficiently explicit, and yet the advocates of imageless thought continue to quote Stout as if he were in reality contending for precisely that which in the passage just quoted he denies advocating. Moreover, in a passage of the 'Manual of Psychology' published a few years later he makes assurance doubly sure by the following statement which surely is not open to misinterpretation.

"An idea can no more exist without an image, than perception can exist without sensation. But the image is no more identical with the idea than sensation is identical with perception. The image is only one constituent of the idea; the other and more important constituent is the meaning which the image conveys" (p. 394).

At another point we read (p. 396):

"... Even the highest development of conception still involves imagery, though the imagery may be, and often is, purely verbal."

In an article in *Mind*, for 1907 [p. 70 ff.], Mr. R. F. A. Hoernlé presents an admirable analysis of the connections of image, idea, and meaning, which has often been used, as have the writings of Stout, to support the imageless thought doctrine. Mr. Hoernlé, however, as I read him, holds a view which is far removed from such a position as that of Professor Woodworth, for instance, and can hardly be put into the ranks of

the true defenders of imageless thinking without the exercise of logical and ethical violence. Mr. Hoernlé is in no sense concerned to deny the presence of sensations and images in our ordinary conscious processes, but rather to point out that it is the meaning, rather than the gross substance of images or sensory materials which constitutes the important part of conscious processes. He says, for example:

"But the fact that a significant psychic whole contains as a subordinate factor sensational elements and that such a whole apparently *cannot be present in our consciousness without the help of such elements*, by no means entitles us to treat them as the only solid and substantial factor, the only objective content, as it were."

(The italics are not in the original.)

He devotes considerable attention to Professor James' account of the focus and the fringe of consciousness, in connection with which Professor James had asserted that the image or the sensation is actually the focal factor, whereas the meaning is ordinarily found in the fringe. Professor James is not on trial at the present time, and we pass over the justice or otherwise of Hoernlé's critique on this particular point. It is, however, interesting to remark that Hoernlé appears to advocate the doctrine that either image or meaning may be respectively focal or marginal. He says, nevertheless, that *sign and meaning are inseparable*. The sign, normally made up of sensational elements, is also normally subordinate, and the distinction of sign from meaning, is, in his judgment, a product of reflection. In his opinion meaning, and not sign, is ordinarily the focal thing. We regret that space does not permit us to consider more fully this particular doctrine of Hoernlé's, for there is certainly some reason to feel that meaning and image are hardly to be distinguished as being in any given case the one focal, and the other marginal. It is at least a plausible view that they come and go together, and that when we say one is marginal and the other focal, we are describing a situation in which one kind of meaning is focal and one kind of image marginal, in disregard of the fact that another type of meaning is simultaneously marginal, and another matrix of imagery is focal. At all events, the facts are not so obvious concerning this issue, as Mr. Hoernlé's account would indicate. Moreover,

there is ground for suspicion that Mr. Hoernlé shifts in his discussion between an account of logical meaning as such, and the experiencing individual's consciousness of meaning, which is often quite another thing.

In a similar way, Binet has been repeatedly cited as an unequivocal advocate of this imageless thought as a real form of conscious experience, which may be present without either sensational or imaginal thought constituents. I am disposed to believe that Binet perhaps has held this view from time to time. But the passages which were originally quoted in support of this interpretation, are altogether equivocal. He said, for example, in a treatise on the experimental study of intelligence¹ that consciousness is chiefly made up of images and words, but that thought may be an unconscious act of the spirit, which in order to become definitely conscious requires words and images. In the same treatise he said that he came upon many cases of thought in which it was not possible for his subjects to detect any imagery. It appears, however, from these citations, that at that time he was not advocating a doctrine of imageless consciousness, but rather a doctrine of sub-conscious or non-conscious intellection. In a later article which appeared conjointly with Simon in the *Année Psychologique* for 1908, p. 333 ff., and especially 339, he takes the ground that thought without image and without words is an actual phenomenon of what he calls intellectual sentiment, whatever this may mean. It appears, in any event, to connect the imageless thought process with affective aspects of mental life, as over against the purely cognitive ones. This would seem to give no comfort to a doctrine of purely intellectualistic thought content, disconnected with the ordinarily recognized elemental aspects of conscious experience.

Professor Woodworth has undoubtedly been the most persistent and unmitigated advocate of the imageless thought doctrine among American writers. Indeed, he has perhaps considered the matter from more angles of experimental study than any other one person. His statements lack nothing in

¹'L'Étude expérimentale de L'Intelligence,' p. 108, Paris, 1903.

radical character, however convincing they may be found. His views are so well known, and particularly to this audience, that extensive quotation is hardly essential. He has from the first advocated the most extreme form of the doctrine, in maintaining that we have moments of consciousness, from which both sensory and imaginal elements are entirely excluded. Moreover, he espouses the most extreme possible view about the independence of image and meaning. He says, for example:

"An image may call up a meaning, and a meaning may equally well call up an image. The two classes of mental content differ in quality as red differs from cold, and anger from middle C. They may also differ in importance for the purposes of a given thought. Otherwise, it is hard to see any essential psychological difference between them." (*Journal of Psychology and Philosophy*, Vol. III., 1906, p. 707.)

He renders it impossible to explain away his alleged phenomena by any reduction of them to physiological or sub-conscious activities, because he asserts with great vigor that the mental states which he has in mind, involve the clearest and highest lights of conscious experience.

In his recent little monograph on the 'Experimental Psychology of the Thought Processes,' and still more recently in his 'Textbook of Psychology,' Professor Titchener has entered upon a somewhat elaborate critical evaluation of the recent germanistic movement, dealing with the analysis of the thought process, as represented in such writers as Watt, Ach, Messer, Bühler, and others. This is altogether the most systematic effort which we have thus far had, to bring together the somewhat discrepant and wholly undigested literature of the subject. Mr. Titchener occupies a relatively conservative attitude on many of the essential points at stake. Nevertheless, he is quite outspoken in his unwillingness to accept the extreme interpretations of the alleged facts such as are advocated by Bühler, and Woodworth. He says, for example, that he remains entirely unconvinced that there is any such independent thought element as Bühler [and in a somewhat different manner Woodworth] advocates, and that neither as a result of his own experimentation, nor as a result of his careful and non-partisan reading of the experimental literature, is he able to feel at all convinced that

the accounts of a knowledge process in terms of sensation and image are inadequate to account for all of the authenticated experiences.¹

We have had a considerable number of briefer discussions in the columns of our technical journals, and one or two independent monographs, like Miller's 'Psychology of Thinking,' Dewey's 'How we Think' and Pillsbury's 'Psychology of Reasoning,' in none of which is the imageless thought doctrine openly espoused and in the first of which explicit ground is taken on the orthodox (?) side of this controversy. Pillsbury, in the *Psychological Review* for 1908 (Vol. XV., p. 158) has argued that meaning is primary and image secondary—in fact only another kind of meaning. The genetic primacy of meaning had already been advocated by Stout. Gore, in an interesting paper on meaning,² has advocated the doctrine suggested by certain of Dewey's positions, that the image represents the stimulus in consciousness, and meaning the response. This is to say that the image is correlative to the structure, whereas meaning is correlative to the use we make of our materials. Professor Mead and Dr. Kate Gordon have advocated similar views in occasional papers, and the present speaker, in his textbook of Psychology, has also an account in some ways closely resembling this. Mr. Thorndike has entered into the general circle of controversy with several papers, and with passages in his 'Elements of Psychology.' He, however, is mainly concerned with the question of volition, and will be considered at a later point. Under the influence of Woodworth and Thorndike, Betts has written a monograph on the Distribution and Function of Imagery [Columbia Cont. to Education, 1909, No. 26] in which he ventures to enlarge upon reports of imageless thinking, after having frankly eliminated verbal imagery from the discussion.

When one brings together all the literature of the subject in English, of which the above citations are illustrative, several distinct questions present themselves as containing the pith of the controversy. These may be formulated in a provisional way, at least, as follows:

¹ *Op. cit.*, pp. 180-182.

² 'Studies in Logical Theory,' John Dewey and others, p. 183.

First, is there an *aspect* of cognitive experience, which is immediately given in consciousness, distinct from sensation and image?

Second, are there *independent moments* of cognitive consciousness, in contradistinction to mere aspects of such moments, in which neither sensation nor image is to be detected?

Third, supposing them to exist, are these alleged moments of consciousness which are devoid of sensational and imaginal components, in reality automatized forms of perception or of ratiocination, which in an earlier stage would have disclosed distinct evidences of imagery or sensation? Are they, in other words, processes well along towards automatism, having originally been characterized by a much higher degree of consciousness?

Fourth, going still further than the previous question, are these alleged moments of consciousness, in reality instances of unconscious cerebration, to use a phrase more familiar to our forbears? Are they instances in which cerebral processes, for the time being excluded from direct contribution to the focus of consciousness, produce consequences which then appear in the conscious stream as the results of reflective thought? In this connection, of course, the advocates of 'split-off consciousness,' of double consciousness, are in position to allege that such phenomena have to do with dissociated foci of consciousness?

Fifth, are these alleged moments of rational thinking cases in which consciousness is monopolized by the awareness of attitudes, in which, originally at least, kinæsthetic sensory elements were conspicuous, but which, in the developed mind become, as attitudes, so habitual as to render introspection extremely difficult?

Sixth, in part equivalent to the second question and appearing as a subordinate feature of each of these problems, is the question whether meaning is a conscious element separated out and existing apart from both image and sensation.

II

With reference to the first point, I doubt whether any psychologist of repute would call in question the affirmative reply to this issue.¹ Modern writers have varied widely in the extent to which they have seen fit to emphasize this aspect, *i. e.*, the meaning aspect, of our cognitive experience, but it would be difficult to bring any satisfactory evidence to show that they disbelieve in its reality, and in the case of not a few writers, from Thos. Brown down, of whom Stout in his 'Analytic Psychology' may serve as a conspicuous example, there has been abundant emphasis on the reality of this feature of cognition.

I find it difficult, therefore, to explain the necessity which Mr. Woodworth has felt to defend so energetically the presence in perception of non-sensory elements of consciousness.² When he points out, for example, the peculiar manner in which we may interpret equivocal drawings as now one thing and now another, he seems to me to be stating merely the familiar doctrine of perception, without adding anything which seriously needs defense, and above all, a doctrine whose truth should not be exploited in the interests

¹Inasmuch as the main contentions of this paper are definitely critical of the experiments and the theories of Mr. Woodworth and Mr. Thorndike among American writers, and of the Würzburg school and its critics among the Germans, to whom more explicit reference will be made below, it is only fair to myself to say that I value very highly the influence of their work in stimulating psychologists to an analysis of the thought processes keener and more searching than any previous generation has known. That I think some features of their procedure open to objection, and that I demur to their conclusions in certain essential particulars, does not at all diminish my sense of obligation for arousing us all to a new interest in problems previously too much exempted from experimental analysis. I am indebted in a personal way for such criticisms on my own published views as have enabled me to clarify to myself, and I hope to others, the convictions which I hold and the grounds upon which they rest.

The more important of the recent German monographs and papers touching the general topics at one point or another are: Ach, 'Ueber Willensthaetigkeit u. d. Denken,' 1905; Watt, 'Exp. Beitræge z. einer Theorie d. Denkens,' *Arch. f. d. ges. Psy.*, IV., 1905, p. 289; Messer, 'Exp. psychol. Untersuch. ü. d. Denken,' *Arch. f. d. ges. Psy.*, VIII., 1906, p. 1; Bühler, 'Tatsachen u. Probl. z. einer Psychol. d. Denkvorgänge,' *Arch. f. d. g. Psy.*, IX., 1907, p. 297; Störing, 'Exp. Untersuch. üb. einf. Schlussprozesse,' *Arch. f. d. ges. Psych.*, XI., 1908, p. 1; Dürr, 'Ueber exp. Untersuch. d. Denkvorgänge,' *Zeitschr. f. Psy.*, XLIX., 1908, p. 313; von Aster, 'D. Psychol. Beobachtung u. exp. Unters. d. Denkvorgänge,' *Zeitschr. f. Psy.*, LXIX., 1908, p. 97.

² *Jour. Phil., Psy., Sc. Meth.*, IV., 1907, p. 170.

of imageless thought, a bird of very different plumage. I do not know where among contemporary psychologists of standing he will find the doctrine seriously defended, that perception involves the framing in the mind of an image prior to the apprehending of the perceived object. Certainly it is not the common view. Yet it is this conception apparently, in one or other of its forms, against which he is arrayed.

When it comes to the question of terminology, to determine what names we shall assign to the various apperceptive factors of experience, it is more difficult to come to agreement, and the actual literature of our subject discloses considerable variance in usage. This difficulty appears at the very threshold in the fact that a writer like Mr. Woodworth, in his discussion of the non-sensory components of perception, is evidently assigning to the category of sensation a highly abstract and artificial significance. It must be admitted that a good deal of our structuralistic psychology has been guilty of such an abstraction. Indeed, it has rather gloried in it and defended its own excesses. But, whether such abstractions be judicious or injudicious, to use the term sensation as applicable to the sheer sensuous qualities of a sense experience, and then upon taking that step to plead earnestly for the introduction of so-called non-sensory 'elements,' is a precarious procedure, provided it can be shown, with any reasonable persuasiveness, that the elements thus called in, are quite as much sensory, as those which they are enrolled to assist: that is, that they appear quite as genuinely in the response of consciousness to peripheral stimulation of the organism. And this they certainly do. This, however, is a relatively minor issue and may be allowed for the present, to rest. We repeat, however, that such a position as Stout's, in which he alleges that every instance of cognitional consciousness contains in addition to such imagery and sensation as may be present, elements of another kind, represented by the meanings involved, this doctrine has, so far as the writer is aware, no serious opponents. Mr. Woodworth, however, while recognizing such elements would apparently maintain that they do not always accompany imagery.¹

¹ *Jour. Phil., Psy. & Sci. Meth.*, III., 1906, p. 707.

We come, in connection with our second point to what is really the crux of the whole matter, and to the most baffling of all issues. Indeed, after going through the literature, one is left with the feeling that the case is largely reduced to mere assertion and denial, occasionally to vituperative re-crimination. It seems to be largely a matter of "It is!" or "It isn't!", adorned with such adjectives as taste may dictate and capacity afford.

Competent introspectionists are arrayed on the two sides of the question, and the results which they bring in are equally unequivocal and equally dogmatic. Under such conditions the burden of evidence would seem to be with those who take the negative attitude and deny the presence of that which the other party alleges to be discernible in its own person. This is logically, no doubt, the case, but scientifically it is a safe tradition which leads to the principle that any radically new scientific element shall justify its existence by unambiguous and convincing proof. However, this is no occasion to stand upon the niceties of etiquette in the matter of proof and disproof. The practical question is, after all, whether these parties, who are divided on this issue, can find some line of approach which will bring them together in reasonable agreement. It is unthinkable that either party to the controversy is prepared to rest short of a friendly conversion of its adversaries, and our immediate problem is first to find some adequate explanation of our differences of opinion, and then, if possible, to remove the source of these differences.

The most peaceable, if not the most natural, explanation for the extreme divergence of views which we meet is that we are confronted by two radically disparate types of mental organization, to one of which a form of thought is native which to the other is substantially unknown. The other obvious hypothesis involves the inference that the introspection of one or the other of the protagonists is essentially defective. The latter alternative seems the more plausible, for it surely seems more reasonable to believe that we differ in our capacity to identify a particular kind of conscious

material, than it does to believe that we are separated from one another by the possession or lack of possession of a fundamental thought quality.

In studying the introspective literature of the subject, one feels that the differences which divide certain of the writers are largely those of mutual misunderstanding as to the precise phenomena under discussion, a misunderstanding fostered in part by wide divergences in thought processes, such as our investigations of imagery types have made familiar, but not a misunderstanding based on the presence in one individual of a form of consciousness wholly lacking in the other. There are a few writers, however, of whom Woodworth and Bühler are fair examples, for whom such an explanation seems relatively inapplicable. I do not mention the other Würzburg contributors, because I find them rather less unequivocal in expression. I judge, however, that Watt might well be added.

With scientists of their training and experience, to say nothing of some of their reagents, the charge of inaccurate introspection is likely to seem to most persons highly improbable, if not preposterous. One may hope that the time has passed when the charge of inaccuracy in such a matter need indicate any personal animus, much less any disposition to reflect upon the general scientific competency of the person charged. Nowhere is the difficulty of observation so great as in the field of controversy now under consideration, and no man has ever worked in psychology with serious intent, who has not at one time or another found himself convicted of serious error in his observational reports. So long therefore as the number of persons remains small, who have been thoroughly trained in introspective methods, and who report affirmatively upon the presence of imageless thought, it will always seem a reasonable interpretation that errors of observation are responsible for the discrepancy between their reactions and those of other trained observers. But the number of individuals who are now to be counted among those making affirmative allegations is suspiciously large to justify this interpretation, although the author is at present obliged, as

the lesser of two evils, to believe that this line of explanation is essentially correct.¹

There are a number of conscious activities, with which it is perhaps easy to confuse the supposed imageless thought process, if one may judge by the accounts offered of this process. For example, the literature is full of evidence that in framing their conclusions at least, not a few persons have failed altogether to distinguish between the presence of objective imagery, especially of a visual character, and the presence of word imagery, whether of purely auditory character, or as more often happens, auditory-motor; or as frequently happens (and when it does happen, it creates the maximum of introspective difficulty) the presence of the suppressed enunciatory movements themselves. Again, the descriptions offered strongly suggest in some cases the presence of highly schematic and extremely evanescent imagery, whether of verbal or other character. In other cases the descriptions clearly indicate that sensory materials, including the attitudes reported by kinæsthetic sensation, are employed as the carriers of meaning, in which case the search for imagery in the proper sense is necessarily futile and predestined to failure. Finally, there are not a few instances in which the descriptive accounts make it all but certain that the actual occurrences involve essentially subconscious activities, which emerge with rational results, and which are then attributed to imageless thought. I am not at all confident that there are not other conditions in which confusion is equally explicable.

These alternative hypotheses, are, however, well known to such a psychologist as Mr. Woodworth, and he energetically rejects all as entirely inapplicable to his own case. He insists that the process at stake is no subconscious affair, and quite the contrary, is characterized by the keenest sort of consciousness. Except by inference I do not find him disclaiming in quite so convincing a manner the presence of sensory and attitudinal factors, although whenever he refers to these as in any way present, he takes particular pains to speak of them

¹In this connection should be mentioned the paper of Dürr who took part in many of the Würzburg experiments and who writes critically of Bühler's more extreme positions. *Zeit. f. Psychol.*, XLIX., 1908, p. 313.

as irrelevant. Whether they are so unimportant as he imagines, I have no method of determining, but their presence I understand him in many instances to admit. I shall later call attention to a fact suggesting that they are not so irrelevant as they appear. The only types of imagery whose denial his statements do not seem to me wholly convincing about, are those which Mr. Colvin has recently termed mimetic, and which the present writer had previously spoken of as schematic, or symbolic. Mr. Woodworth, however, must be entirely conversant with descriptions of this type of thinking, and presumably he would have identified it, if it were present in his consciousness. Certainly it is far from my intention surreptitiously to inject any such heterodox psychological virus into his system, although I frankly doubt whether his thought is as pure as he supposes. He sometimes refers to it as 'naked' and in view of its lack of descriptive raiment, this seems to be a good term.

A naturally trustful disposition is somewhat disturbed by the absence from Mr. Woodworth's reports of detailed and accurate descriptions of his imageless equipment. He surrounds himself with a cloud of negatives, denying that it is visual or auditory or tactual, denying that it has any sensational or imaginal composition, and leaving us with a mere apotheosis of the void, so far as concerns any positive assertions. It appears to be closely related to the smile of the Cheshire cat which remains after the cat has disappeared. Of course, it may be that those of us who are organized on the simpler, old-fashioned plan of sensations and images with their meaningful aspects, may be incapable of appreciating a more accurate description of these sublimated experiences. But at least we should like to have a try at it, and we seem to get but little assistance on our way, by listening to this mere chorus of negatives, telling us what the imageless thoughts are not like. Jestings aside, it certainly seems odd that it should be impossible to do more than sit back and allege the presence of these elements, if they are so important in the structure of the thinking of these individuals. Certainly the products of their thought are not markedly less

valuable, and, when reduced to words, are not notably less lucid than those of persons frankly indebted to the use of imagery for their thought processes. It seems odd, therefore, that so little has been done, and that therefore presumably so little can be done to make clear to those of us less richly organized what kind of possession an imageless thought really is. We may be abnormally stupid.

Bühler¹ makes a serious effort of this kind, but after he has gotten through denying sensation, little is left but functional terms such as I myself should use in describing attitudes or meaning or relation.

Mr. Woodworth has, so far as I know, laid rather more stress upon the presumptive support given to his doctrine by the facts of cerebral anatomy and physiology, than any of the other writers on this subject. He has repeatedly referred to the fact, which he regards as highly significant, that so small a portion of the cerebral cortex is sensory in character. From this he draws the inference that presumably the other areas of the cortex subserve functions which are distinct from sensation, and which consequently may be expected to find counterparts in consciousness which are not of a sensory character. It is, of course true, that anatomically there are very considerable regions of the cortex which do not receive impulses directly from sense organs, but on the other hand, it is not to be forgotten that the evidence is very strongly indicative of the fact that whereas one large group of regions receives impulses from the sense organs, and other large regions are concerned with the discharge of impulses into the muscles of the body, the remaining regions serve anatomically, and presumably physiologically, to connect these sensory and motor regions with one another. Ordinarily, as regards the great mass of these interconnective, or 'association regions' as Flechsig calls them, stimulation is transmitted from sensory regions either into other sensory regions, or, as probably occurs ultimately, out into motor regions. From this point of view the system is essentially unipolar in character, and it is difficult to suppose that any cortical

¹ *Op. cit.*

portion can be wholly devoid of some sensory component in view of this fact that the sensory components are prior in the series of normal innervations to the stimulations of other regions of the cortex. However, all this type of speculation must be regarded as of extremely problematic value, whether to defend, or to attack, the view of thorough-going imageless thought—at least thought considered as strictly conscious.

Mr. Woodworth commits himself also to a view which he has expressed in more extreme language than the author recalls to have seen elsewhere, in his separation, already referred to, of meaning and image. [This concerns our sixth question.] He speaks in the most confident way of the appearance of a meaning entirely devoid of an image, and conversely of an image entirely devoid of a meaning. For example, he says: "Meaning is not felt as a relation between the image and an object, but as *the thought of the object* It (*i. e.*, meaning = thought of the object—J. R. A.) is as substantial an element of thought as the image, and there is no absurdity in the notion that it may be present alone. (*Jour. Psy. Phil. Sc. Meth.*, 1906, p. 707.) We have already quoted another passage in which he makes the radical announcement which follows. It seems altogether improbable that Mr. Woodworth can have in mind by 'meaning' just the sort of thing that some of the rest of us have, when he makes this statement:

" . . . The two classes of mental contents differ, in quality . . . they may also differ in importance . . . otherwise it is hard to see any essential psychological difference between them." [*Loc. cit.*]

Whether he has gained any comfort from Messrs. Pillsbury and Gore, who have spoken as though image and meaning were in some sense co-terminous with one another, the author does not know, but he is disposed to believe that these gentlemen have a different doctrine in mind. To say that two psychological qualities differ from one another as 'anger from middle C' and then to polish off the statement with the assertion that it is hard to see any other essential difference between them, is a good deal like saying that black is not

white, but that otherwise they are highly similar. If it proves anything for Mr. Woodworth's doctrine, it would appear to prove too much, for it would indicate that meaning, which is for him, as it is for others, one of the essential relational features of consciousness, is itself an image in disguise. However, the present writer is too much in doubt as to Mr. Woodworth's intent in this particular of his doctrine to discuss it intelligently. In the article from the 1906 *Jour. Phil. Psy. and Sci. Meth.* (p. 708), he says, however, that probably all thinking originates in terms of meaning, but that some persons have more excitable sensorial processes and so get images. This conception of course makes the image a mere annex to the essential process. He calls it 'by-play.' Bühler, be it said (*op. cit.*) holds that his 'thoughts' are quite distinct in every way from the 'ideas' with which imagery is found connected.

If now we return for a moment to our first assumption to explain the fundamental discrepancies between our controversialists, we are obliged to accept the existence of two radically distinct types of organization for thought. There is perhaps no more *a priori* reason for refusing to make this assumption than there is for questioning the reality of race distinction on the physical side, but all the analogies which it is easy to lay hands upon in the way of organic divergences within the same species, suggest variation in the line of special development, or lack of development, in tissues which are common to all the members of the species. The case now before us, if we accept this analogy, is of a different kind. It is comparable in character to the discovery of a race of men having six fingers instead of five on each hand, or having two noses or three eyes. Mythology presents us with characters of this sort. The anatomical museums also present us with such materials, but they are recognized at once as abnormal in the latter case and imaginary in the former. They do not represent types which are perpetuated and constitute any considerable portion of the race.

Now with the best will in the world, the author does not find it possible to discover any middle ground between these

two hypotheses, provided one excludes the assumption that we are really dealing with a subconscious process or with the unconscious cerebration of the earlier writers. Woodworth and Bühler, at least, are certainly not talking about subconscious processes. Binet, on the other hand, in some of his writings, certainly has had this in mind, and has given his assent to the reality of such subconscious thought. But this alternative being put aside, and all fallacy of introspection being ruled out, there appears to be no other adequate explanation except that of the existence of two different types. As between these two necessary alternatives, the writer does not hesitate to take the former as scientifically the more conservative, and up to the present time the more justifiable. It is more reasonable to assume that the introspection of a few men, however competent, may have gone astray (perhaps as several critics have urged, *because* of their method), than to introduce an element which many men, presumably equally competent, are wholly unable to verify. Undoubtedly it is the part of an open mind and of scientific honesty to be hospitable to all such new comers in the field of scientific observation. But whenever such a new-comer arrives without a properly certified passport, it is not unfair to insist that he be detained at the frontier until he can be carefully examined, and his fitness for ultimate citizenship convincingly demonstrated. This appears, in the author's view, to be the present situation in regard to the hypothesis of imageless thought.

It is a far cry from our catalogue of points to be discussed, for we have tarried unduly long perhaps on the second of the issues raised. But this was really the central issue and the rest are of secondary significance. Our third point concerned the possibility that the alleged imageless thoughts were in point of fact automatized mental acts which in an earlier stage would have revealed distinct evidences of imagery.

Speaking for himself, the author has no question that in his own thought processes there are many occasions where thinking is carried forward by verbal imagery so highly schematized and so automatized as all but wholly to escape

identification. Moreover this schematism in the imagery is often an incident of the process of 'telescoping' to which many of the writers on this topic have called attention. In view of this fact, the author cannot refrain from strong suspicion that in the case of many of the less experienced observers, imagery of this variety may well have been overlooked. Nor is it the contention of the more thoughtful advocates of imageless thought that such schematic and compressed imagery may not serve a purpose in the conveying of the meanings of thought. On the other hand, however, we have a number of instances of observers whose reports cannot be called in question on the ground of lack of training and general professional competency. When these authorities insist that there is not a vestige of such schematic imagery, one must either accept their statement as fact and make the best of it, or resort as do the writers previously cited to a charge of introspective fallacy. Wundt, for example, alleges that the imageless thought is a consequence both of defective observation and false presupposition.¹ Titchener attributes the fallacy 'to the stimulus error,' by which he means the failure to distinguish the attributes which belong to the stimulus from those which belong to the consciousness of it.² An issue of this character is hardly likely to be settled merely by dogmatic affirmation and denial, which is the level at present characterizing the controversy. Unless some more crucial experiment can be discovered than has hitherto been employed, so that one party or the other can be brought to a conviction of the correctness of the view of the adversary, we must simply wait for the amassing of evidence in the hope that the accumulation of experimental results will slowly create a presumptive proof for the position of one or other of the contestants.

¹ Wundt says: "The *actus purus* of the thought experiments is no fact of observation, but simply a consequence of defective observation and false presupposition." (*Psych. Studien.*, Vol. III., 1907, p. 347.)

And again: "If one abstracts from the logical reflexions of the observers, the results show that the observers have observed nothing! The thought stood as a whole clearly before consciousness. But it was disembodied, incorporeal. Here at last we have come again upon the *actus purus* of the scholastics." (*Ibid.*, 344-5.)

² Experimental Psychology of the Thought Processes, p. 145.

Our fourth consideration touching the explanation in terms of unconscious cerebration is also thrown out of court as irrelevant by most of the defenders of imageless thought. As we have seen, they allege in the most explicit way that the experiences to which they refer, so far from being non-conscious, are among the most vivid and distinct which they ever meet. This, of course, does not prevent their entertaining the hypothesis that non-conscious cerebralistic activities may produce consequences which may emerge in the field of consciousness at some later period. Binet, for example, speaks of the fact that thought itself is unconscious, but that unconscious processes exercise a directive influence over the flow of conscious states. I am not aware that any of the cohorts of imageless thought has appealed to the facts of 'split-off consciousness' to account for the phenomena involved. They seem rather to have in mind a highly explicit form of normal awareness, which however, baffles description in any ordinary terms.

Our fifth point touches the question of the possible explanation of the alleged imageless thought phenomena in terms of awareness of attitudes, especially such as involve experiences marked by the presence of kinæsthetic sensations, due to the assumption of particular bodily poses. Here again, the present author would take a strong affirmative position so far as concerns his own thinking. In many instances the closest approach which he ever secured to a state in any way strongly suggestive of the descriptions of the imageless thought proprietors, is in connection with certain reflective activities, in which there is from moment to moment an almost entire absence of describable ideational material, but with a most vivid consciousness of the directional and attitudinal kind involving vivid kinæsthetic experiences. When these experiences are met with, it is often quite impossible to find anything descriptably present except the awareness of an attitude of expectant strain sensorially reported, together with which there is a keen apprehension of the direction in which the thought is about to move. This is often characterized by a very definite sense of the

multifold associations of a nascent kind connected with the thought, but not rising to the focus of attention. And again, the present author would be strongly disposed to interpret the introspective deliverances of many unpracticed subjects in accordance with an explanation of this type. But we are met with so positive and heated denials of the reality of this explanation on the part of the most sophisticated of the observers among our adversaries, that we are obliged to question the adequacy of such an explanation for some at least of the experiences at issue. Here again our only lines of advance would appear to be those suggested in connection with point four.

As regards point six, few of the imageless thinkers take so extreme a view as does Mr. Woodworth in his separation of the meaning factor from the image. We have already quoted him to the effect that either image or meaning may come to consciousness entirely independent of the other. We have also remarked that this view is flatly contradicted by a number of high authorities conspicuous among whom is Stout. As in all these cases, Mr. Woodworth will brook no appeal except to fact, and in his own case, he is apparently perfectly certain that meaning and image appear in the separate and distinct way above indicated. No other view could well be tolerated by him because of the extreme form in which he defends his imageless thought. The issue reverts again, therefore, to the old question of reliability in introspective report.

Thus far I have only remarked two writers, Bühler and Woodworth, who seem to adhere to this extreme formula and Bühler's conception of his 'Gedanken' is such as to render this formulation misleading as applied to him. Binet's first statements about the matter were certainly couched with a view to recognizing the fact of unconscious cerebral activities rather than the presence of a strictly conscious experience devoid of sensational content. His later accounts have, as already indicated, introduced the notion of the intellectual sentiment or feeling, a suggestion which the present writer can partially sympathize with in so far as it indicates the presence of

thought processes in which the strictly cognitive elements are submerged under affective attributes. The difficulty of description might well connect itself with this affective, non-cognitive character. Miss Calkins has expressed herself in a way which confirms my own reading. She says:¹

"The writer of this paper frankly deprecates the tendency of certain psychologists—of Stout, Bühler and Woodworth, for example—to insist that the occurrence of imageless thought has been proved. . . . What is abundantly proved is that along with imagery, and often in the focus of attention, when one compares and reasons and recognizes, are elements neither sensational nor affective."²

The author, together with many other psychologists, after the most painstaking efforts to ascertain what actually occurs in his own experience, is wholly unable to confirm the appearance in consciousness of any such meaningless image, or of any such imageless or sensationless meaning. For reasons that no doubt have grown out of the similar observations of a long line of psychologists and logicians, the general theory has arisen which alleges the invariable interconnection of these two phases of mental life. To suppose that one can occur without the other is utterly to destroy the entire foundation on which rests the theory advocated by most of us concerning cognitive operations. Doubtless each of us would promptly abandon the theory provided we were confronted by convincing evidence of the fallacy of the data upon which it rests. But until we can secure something like unanimity of competent introspective opinion on the matter, we can hardly be asked to throw overboard our hard-won convictions, which equally with those of our opponents are based upon what we believe to be unimpeachable facts. A meaningless image is to the present writer not only a thing never experienced, but also a thing in the nature of the case ridiculous, a physical object free from the attribute of gravity, a light devoid of wave-length. In the same way and for the same reasons an imageless or sensationless meaning seems an impossible as well as an unexperienced event.

If we accept Woodworth's pure thoughts we commit ourselves to a belief in the prodigality of nature such as has not

¹ *Am. Jour. Psych.*, Vol. XX., 1909, p. 277.

² For reasons which the present writer has made clear in a previous paragraph, the inclusion of Stout in this list appears to be unwarranted.

generally been entertained in modern times. I do not find that he assigns in any convincing manner, a function to these pure thoughts, essentially different from that subserved by ideas of the ordinary variety, *i. e.*, meaningful images of objects or words or acts. Evidently, unless this can be done, we are invited to suppose that we have two generically different thought materials to accomplish one and the same result. Clearly this *may* be true. But it flies in the face of well-grounded prejudice and tradition to admit it. Possibly Mr. Woodworth calls in question the doctrine that ordinary ideas operate as we have always supposed. Certain of his statements seem to lend themselves to such interpretation.

Relevant to this point it may be added that so far as I can discern, the appearance of imageless thoughts is not connected with any specifically assignable kind of situation. They may appear on one occasion only to have their places taken by ordinary ideas on another similar occasion. This seems at all events to be the experience of many of Mr. Woodworth's subjects. They appear, therefore, to be somewhat sporadic and irregular phenomena, which is certainly not what we might expect, if they play so important a part in thinking as their defenders would have us believe. So long as they disclose vagaries of this kind, we may justly demand and wait for their further analysis before accepting them.

Bühler takes rather different ground on this issue. He apparently regards his Gedanken as serving a different and higher function than ideas. Time fails me for a careful analysis of his contentions on this point, but it is perhaps not unfair to say that they have received very severe criticism from a number of competent psychologists. Wundt, as will be remembered, refers to the Gedanken as constituting a return to the *actus purus* of the scholastics. Whether this be scholasticism or not, the view which regards ideas and 'pure thoughts' as subserving essentially different functions, appears to be much better entrenched logically, than one which more nearly identifies their properties. I do not find Bühler's citation of fact anywise conclusive as to his theory,

but merely as theory, it is intelligible and defensible. It smacks, nevertheless of the Kantian Reason.

III

We turn next to a brief survey of the evidence concerning the part played by sensory and imaginal elements in the control of our movements. Here again, Mr. Woodworth has been among the most active critics of what he calls the orthodox view, and he has contributed not a little of the most interesting experimental evidence bearing on this issue. His colleague, Mr. Thorndike, has also been a stalwart advocate of essentially the same views as those advanced by Mr. Woodworth. On the fundamental issue as to whether or not we possess the imageless thought for which these authors stand sponsor, there is little to be added to what we have already said. But they bring forward in the case of voluntary control a number of considerations which do not figure in the discussion of reflective and constructive thinking. A few notes on these additional points may therefore be permitted.

Mr. Thorndike, for example,¹ alleges that in willing *not* to make a movement we frequently find present the resident and remote sensations caused by the movement itself (or the images of these sensations), which, according to the orthodox theory, as he interprets it, ought to be used *only* for the willing *to* make the movement. Therefore he infers that these sensations or images must be irrelevant to the actual production of the movement.

This case when it arises, instead of affording a difficulty, would seem to constitute a peculiarly telling confirmation of the importance of the sensations and images concerned. To will *not* to make a movement is in so far to have that movement in mind. If the mere act of this negative willing itself reveals these sensations and images present, when all that is required is the identifying of the movement to be inhibited, it would seem to offer strong presumptive evidence of their essential significance for executing the act to which they properly belong. In the particular case cited, they are ir-

¹ *Journal of Philosophy, Psychology and Scientific Methods*, Vol. IV., 1907, p. 40.

relevant, except as reliable representatives of the movement to be estopped, and in any event I do not understand Mr. Thorndike to allege that they are always present on such occasions.

Again, Mr. Thorndike writes that we cannot well possess images, whose resident sensations are not obtainable. He cites those of willing to move the eye smoothly across a line of print, and urges that because we now know that the eye does not move smoothly, but moves by jerks, we could never really have willed this act in the manner alleged by the orthodox view.

It may certainly be admitted as truistic that we cannot obtain images of sensations which we cannot experience. But so far as concerns controlling eye movements this fact appears to be a trifle irrelevant. It may well be in the case of eye-movement, which has so many reflex factors involved, that the resident sensations and images play an insignificant part in motor control. At least, this may easily be the case, if resident be taken to mean kinæsthetic and be set over against retinal factors. It does not appear, however, just what bearing this consideration has on the fact that a voluntary movement proves under scientific scrutiny not to be precisely what common sense has supposed. It requires some kind of 'cue' under its new guise, as well as under its former one. Whether this cue be sensory or imaginal, or consists in one of the pure thoughts, is a matter for further determination. The argument appears to have force only against the theory that voluntary control always involves the employment of imagery which reinstates strictly kinæsthetic sensations, a theory whose proof ought not to be demanded of the believers in the invariable presence of sensory or imaginal material of some kind at the outset of voluntary movement.

Again, Mr. Thorndike writes that it requires too much time to get the image of each movement in a series of co-ordinated movements, such as those of speech, or writing, or the playing of a musical instrument.¹ I have not been able to discover any orthodox (!) psychologist, who has made

¹ Burnett enlarges upon this point in a paper reporting experimental observations. 'Studies in Phil. and Psychol.'; Garman Commem. Volume, p. 393.

statements reasonably interpretable as this assertion requires in order to have point, but I am quite prepared to believe that such statements are in existence. Certainly the view which has commonly been held by writers like James, for example, has been that a single cue may be adequate to release a long series of coordinated movements, provided only that these acts have been built up in some habitual manner, so that they are more or less automatized. Relative to this point, the author may remark that a number of experiments carried on in his own laboratory have revealed cases in which it has been possible to secure imagery very much more rapidly than the movements could be executed expressive of the imagery.

In the experimentation which Mr. Woodworth and his students have carried out, or which Mr. Thorndike has undertaken, there has been a crucial defect in method in the writer's judgment, which he has more than once pointed out. It is utterly unsound as a matter of method to give subjects verbal instructions concerning the movements which they are to make, and then to draw a negative inference concerning the part played by sensory and imaginal material, because, under such conditions, a certain percentage of these persons detect no imagery in the execution of the act a little later on. In the verbal cue, in this case, we find all that is needed to give precisely that 'set' to the nervous system, which Mr. Woodworth has himself so tellingly described. But the 'set' itself is occasioned by the sensorially apprehended directions. The author has participated in a long series of experiments directed to the analysis of this movement consciousness. Neither in himself nor in the many students who have served as subjects for these experiments, has there ever been a scintilla of real evidence for the initiation or control of a voluntary movement entirely without sensory or imaginal supervision. This control has often been found emanating from factors which ordinary introspection would have regarded as entirely irrelevant. For example, the control of the writing process has in certain of our subjects shown itself as dependent to a very marked degree on the sound made by the pen as it moves over

the surface of the paper.¹ Ordinarily this experience is regarded as constituting a mere annoyance and as in no sense an essential part of the control. Some of Mr. Woodworth's irrelevant conscious facts may have a similar unsuspected function.

In most of the experiments which these authors have relied upon to make their case, they have used relatively habitual forms of action, in which only a slight cue is in any case necessary to precipitate the act. In the other type of case which they cite, where a relatively new coordination is brought under control, the evidence seems to the writer perfectly convincing as regards the presence in an essential way of sensory or imaginal factors. For example, to look at the foot, or to attend to sensations from it, while trying to gain control over the muscles of the toes, is certainly in no sense to produce a situation in which sensory direction is entirely wanting.²

There is, here again, as in connection with the topic of reflective thought, a tendency to magnify unduly those features of other authors' writings, which they feel confirm their own views. This is no doubt an entirely unintentional over-emphasis on one side of the case. Bair, for example, whose work has sometimes been adduced in support of this view of the pure thought control over movement, makes it perfectly obvious as I read him, that in his experiments, sensory factors were repeatedly found indispensable to securing control over the muscles of the ear.³ The author has already made quotations from Stout, which show how different his view is from that held by the gentlemen now under discussion. Of him Mr. Woodworth writes:

"Some authors, Stout, Binet, and recently Bühler, boldly assert the existence of imageless thought." (*Journal of Philosophy, Psychology, and Scientific Methods*, Vol. III., 1906, p. 701.)

One does not like to call attention in a spirit of carping criticism to matters of this kind, but if the appeal is in any

¹ Cf. Downey, 'Control Processes in Modified Handwriting,' *Psychol. Rev. Monog.*, Vol. IX., 1908, Whole No. 37.

² Cf. Woodworth, 'Le Mouvement,' p. 330.

³ *Psy. Rev.*, 1901, Vol. VIII., p. 476.

way to be made to the authority of opinion, it is fair that this opinion should be ranged where it belongs.

On the whole, the author is much more disposed to be dogmatic about the case of voluntary control, than about the case of reflective thinking. His own experience, and that of a considerable number of expert persons, who have worked on the problem in his own laboratory and elsewhere, leads him to utter skepticism of the control of voluntary movement, without sensational or imaginal factors. Moreover, there is good indirect reason why such control should not occur, although evidence of this type, if unsupported by more strictly empirical evidence, would have no especial significance. But if one thing stands out more clearly than another in the general contributions of comparative psychology, to our general theory, it is that the original reactions of animals are made in response to sensory stimulations, and that the primal significance of the reactions is to be found in the adjustment which they represent to the stimulating objects. Memory, when it makes its appearance, also finds its significance in the guidance of these movements of reaction, and it is memory of the sensory incentives and consequences—not memory of the purely extra-sensorial kind. If, at a later stage of development, thought processes are developed, which have no direct dependence upon, nor connection with, the world of sensory experience, such thought processes must have only a very secondary reference to the control of ordinary muscular activities. But, as said above, considerations of this kind are of altogether secondary consequence as compared with the direct introspective evidence gained under experimental conditions. For himself, the author is perfectly clear that these control conditions are always of a sensory or imaginal character. But it needs to be repeated that for him neither sensation nor image as such is to be regarded as isolated from the correlative fact of meaning, and meaning is not for him in any sense equivalent to the mere sensuous content of the mental state, whether it be dominantly conditioned by peripheral or central stimulation.

Finally, then, I find the doctrine of imageless thought open to suspicion on the following points:

1. The method of its experimental investigation is at least not wholly satisfactory in meeting the demands of ordinary experimental procedure. This is true, both as regards the problem of reflective consciousness, and that of voluntary muscular control.

2. Imageless thought seems with many observers to be a sporadic and occasional phenomenon. Its appearance is not in their cases invariably connected with any special kind of situation. It consequently lacks one usual characteristic of well established thought forms, and may therefore well be regarded a trifle askance.

3. Unless purely functional and logical terms be used, it seems almost impossible to describe it, save in negative terms. This suggests either that the analysis is not yet complete, or that the thing analyzed is not really a content of consciousness.

4. If Mr. Woodworth's variety be accepted as genuine, we must apparently recognize two generically different kinds of thought material to serve one general function. This will be at variance with our conceptions of the parsimony of nature. Mr. Woodworth's effort to exhibit the two forms as respectively primary and secondary to one another, will scarcely serve to avoid the factual difficulties even though it afford a logical solution. Meaning and imagery differ from one another in essential function not as does one form of imagery from another form, merely in quality. If we accept Bühler's conception, we have ideas limited in their function in a manner utterly at variance with ordinary opinion.

5. There are many well recognized conscious states which may obviously be readily confused with imageless thought. The consciousness of attitude, springing out of very primitive physiological attitudes, is an important case in point.

6. The presence of interpretative factors in perception gives no real comfort to belief in imageless thinking.

My own conclusion is that at present, the only demonstrable imageless thought is subconscious, and so primarily a matter of cerebralistic physiology. Even this would be imaginal, if it got above the limen. But I shall try to keep an open mind.

THE SYSTEM OF HABITS AND THE SYSTEM OF IDEAS

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The history of the individual mind presents, from the outset, a field of complex phenomena; it has many phases, in each of which developmental changes are occurring; with the surrounding world it has manifold points of contact; and the quantitative contents and forms of organizations by which it is characterized reflect the variety and complexity of the world in which it exists.

The student's direct approach to this complex life is beset by many difficulties. To picture it in its fulness is impossible; to combine the essential features of each phase of change in such a way as to give a view of the mind's constitution at any point in its history, is a task of scarcely less difficulty. In the face of these obstacles the psychologist has usually fallen back upon one of two procedures,—either he has considered the general form of the changes under way, as when the rate at which variation occurs is studied, and the accelerations or retardations in development are indicated; or he has selected some individual phase of change for study, as when the establishment of motor coördination is traced or the development of speech followed. This work is indispensable to a full description of mental development, and each such study finds its place in the final system of genetic psychology.

But in all genetic study,—in the description of the mind's development equally with that of organic genesis—there is more to be done than to determine the general formal changes which the subject matter presents, and to trace the development of its various constitutive functions. These studies, indeed, presuppose another form of analysis as their logical antecedent: for in every organic system which has historical and not merely logical reality, a unity of constitution is to

be predicted. It is this assumption which underlies all elementary analysis, upon the systematic completeness of which rests the success of explanatory science generally. The assumption of a single constitutive unit and a common type of change characterizes the procedure of historical sciences at large and constitutes the ground-work for all subsequent treatment of a specialized character.

In the study of mental development, as in all other genetic science, this preliminary analysis must be undertaken, and the complex of mental changes treated in terms of the units which it yields. The student of genetic psychology thus sets out from the assumption that the qualitatively various modifications which the life of the individual mind presents are the complex products of a change the units of which are fundamentally similar throughout the whole series of phases. His first task, therefore, is to formulate these constitutive factors and to explain the system of changes in their terms.

The general character of mental development may be described as adaptation. At all stages and in every phase of its activity the change from the earlier to the later form is a reconstruction which tends to establish more harmonious relations between the individual and his environment, to restore a lost equilibrium between the forces which act upon the mind and its own responses. Adaptive reconstruction constitutes the general form of change, whether the origin of determination be conceived as lying in the environment and producing a simple adaptive modification, or the element of initiative be considered, in the utilization of materials for ideal ends. Such adaptation is incessantly renewed so long as the individual continues to live. That at one stage it leads to more systematic complexity in the reaction to stimulation, and at another stage results in a narrowing of the range of reactions,—that at one time it is constructive and progressive and at another involutionary and conservative, is a question of the special form of readjustment which occurs, and does not affect the general character of the process.

Adaptation involves two factors, a form of response already elaborated and an action tending to modify the adjust-

ment in conformity with a variation in the system of stimuli. The former represents the level of adaptation already attained by the organism, the latter represents the increment of advance in which the fact of development consists. The first of these two factors we call *Habit*, the second *Accommodation*. *Habit* constitutes the response of the organism to its environment in so far as the system of stimuli possesses permanence in the course of experience; accommodation constitutes the organism's response to variations appearing within this system of stimuli.

In so far as the variation thus introduced becomes a constituent of the system of stimuli, this means simply the formation of a new habit, the development of a fixed type of response arising through a modification of those forms of reaction which previously existed, and replacing them in the economy of the mental life. In so far as concerns its outcome, accommodation thus adds nothing new, nothing which is not fully represented in the habit-system from which the process of reconstruction took its start. The movement of development is a circular one, from preëxisting habit through accommodation to later modified habit. The terms habit and accommodation, therefore, do not serve to define the opposition which is here in question, since they have application primarily to the objective reference of the mind's attitudes, and the relations which it bears to the system of outer reality.

From the psychologist's standpoint it is the immediate conscious reaction provoked by such variations in the system of stimuli as do not arouse an already established adaptive response which must be opposed to habit and called its correlate in the system of factors constituting accommodation. This immediate reaction we call attention to the stimulus. Instead of provoking an habitual response it arouses an awareness of its own quality and of the relations in which it stands. The nature of the stimulus is thrown up in consciousness, as upon a screen, and while, in such cases, the immediate teleological response is characteristically lacking, it is through the development in a systematic consciousness of the associative complex in which the stimulus stands that the individual is led

to that later reconstructed type of reaction which constituted the fact of accommodation. To habit is thus to be opposed attention, discriminative and selective, and the systematic consciousness to which it leads. Of this selective consciousness accommodation is a function, and from it derives the whole succession of modifications which constitutes the course of mental development.

The two constituents of mental development may thus be described as the system of habits and the system of ideas. It is the progressive organization of a system of habits and the continuous elaboration of a system of ideas. Each of these factors has a specific function and a continuous history in mental development. The system of habits represents the organism's response to the permanent aspect of the environment; the system of ideas represents its response to the variational aspect. Wherever the system of stimulations presents recurrence, the organism responds with a habit; wherever that system presents novelty the organism responds with an idea.

At every stage of its history these two factors are involved in the mind's activity. There is no consciousness which is not determined by preëxisting habit, nor is there any habit which is not subject to modification through the consciousness which accompanies it. On the other hand, the relation of these two factors determines the character of any experience; and their concomitant variations mark the range of activities by which the mental field is characterized. In those provinces within which the relations between the organism and its environment are highly defined and maintained with relative continuity, the points at which consciousness is aroused are few and unimportant. The element of habit constitutes the dominant feature of the situation, and awareness of the qualitative character of the stimulus falls to its lowest ebb. Where, on the contrary, such relations are ill-defined and subject to frequent and profound alterations, a fixed type of response does not supervene, but attentive consciousness attains its greatest acuteness.

These two constituent factors of development appear in

every field of mental activity, and throughout its range maintain their fundamental significance unmodified. The function of genetic psychology is to define the place and contribution of each factor in any given phase of mental activity, and to trace the evolution of the organic system to which the two elements lead in their respective spheres.

Thus in the description of the system of perceptual and of conceptual objects alike, both of these factors are found indispensable. The response to each object of perception involves habit, since reaction to such stimuli depends upon the recurrence of typical sensation complexes in the individual's experience, the momentum of habituation in the reaction varying with the fixity of these complexes and the frequency of their recurrence. In so far as this element of routine prevails, the adaptive reaction provoked by the stimulus is automatic and unaccompanied by consciousness. In so far as the field within which the stimulus lies is subject to fluctuations, and the relations between it and the organism are incessantly disturbed, the reception of the stimulus and the reaction to which it leads will be pervaded by consciousness.

It is sufficiently obvious that the system of objects which constitute the field of perception will not become the source of a series of purely automatic adaptations. The calling forth of a wholly unconscious and habitual response will be approached only in cases where a great simplicity in the stimulus obtains, and where a high degree of uniformity in the conditions of its occurrence is possible,—as in certain mechanized signals of rhythmical recurrence with which an unvarying response is connected. If this type of reaction developed in connection with the general system of stimuli which the sensible world presents, the individual would constantly be involved in disastrous situations through variations in the concomitants of the particular stimulus which conditioned his response. There is perhaps no conceivable situation for which a purely automatic reaction constitutes a sufficient adaptation, since from none is the possibility of significant variation at any moment absent. The reactions

connected with even the most familiar objects are subject to incessant subtle modifications; and the possibility of these modifications must at every instant be taken into account in the formulation of the response.

This potential variability in the stimulus conditions what we call attention to its character at each recurrence. Perception, in a word, represents the margin of variability in the field of the stimulus. The response which the individual makes to sensible objects thus involves both attention and adaptive movement; and its elaboration gives rise on the one hand to a system of habits and on the other to a system of ideas.

In the field of conceptual objects the same phases appear. This is perhaps best illustrated by the form of the individual's reaction upon the familiar terms of speech. The response to significant speech involves the element of habit in so far as each word provokes an unreflective response in terms of the adaptation, or meaning, which it represents. The warning may thus be acted upon without distinct awareness of the words which have prompted the action. It is only when meaning is doubtful, when words are ambiguous or construction obscure, that attention is directed to the form of expression, and the margin of variability in the stimulus is developed in a critical review of the possible applications of the term.

But reflection shows that grammatical construction, at least, is always variable; and that habituation can reach a high degree of development only in connection with common words and their uses, or at most with certain simple and unvarying constructions which are in frequent use. Such are the current verbal coin of polite intercourse, the forms of which are stereotyped and become devoid of specific significance, and, on the part of user and hearer alike, lapse into practically complete automatism. In the case of all ordinary human intercourse, significant speech is essentially mobile and variable. Every element has a meaning of its own, which constitutes, in a sense, the core of the whole system of meanings connected with it; but as an element in a sentence it has a meaning which is defined only

by the context in which it is found, and cannot in any way be determined by its signification in isolation. Even when used without context it is rarely, if ever, that a term is univocal, and that it may be responded to by a single unvarying reaction.

In any case, then, response to the forms of human speech involves incessant attention which must continue throughout its course. The development of the margin of variability ceases only when the expression is brought to a close, since the meaning is constructively developed, as the terms are apprehended in succession, by a progressive modification of the whole preceding context. Every syntactic form is thus typically unique, with the exception, noted above, of such expressions as have become stereotyped; so that it is logically inconceivable that an automatic response should ever be established in connection with it. It is this character which makes human speech so much more stimulating than the perception of the sensible world. The latter approximates the values of speech as an ideal stimulus only in those extreme cases which may be termed crises, namely such as call for immediate and difficult coördination, danger, personal encounters, the control of active and variable forces, and the like. In the apprehension of human speech the margin of variability being greater and of more continuous importance, the system of ideas attains a higher functional development than that which it presents in connection with the perception of the external world. Speech provokes an incessant, lively and variable play of ideas which is the necessary consequence of the fact that from its very nature speech cannot indicate its object intuitively, but must make it known through a system of discursive symbols.

A similar quality appears in the relations which may exist between any mental image, or any concept, and the context with which it is connected in individual thought. The connections linking a series of ideas which successively occupy the mind may be so simple and variable that each suggests the next in an immediate and inevitable manner and the last of the series may lead to specific reaction without any

reflective consciousness concerning the internal constitution of the ideal system by which its occurrence was mediated. Only the terms of the series, as the event is recalled in after-experience, seem to have been in mind, the intermediate elements, whether one or many, having apparently dropped out of existence. It is not necessary, in such cases, to deny that mental activity of any kind has occurred, but if the occurrence of a succession of ideas be granted, it has conformed so closely to the habit type that attention to the constituent elements has fallen to its lowest ebb, and the margin of variability which conditions consciousness is practically negligible.

Such successions are possible only when the order of associations is extremely familiar, when thought is following some thoroughly trodden path. In every mind such idiosyncratic forms are developed, and all permanent social life fosters the establishment of common ideal types which tend inevitably to the form of habit-modes in popular usage. Such ideas are received uncritically and provoke immediately certain specific mental attitudes in relation to their object which also commonly prompt stereotyped communal expressions. Every human group owns such authoritative conceptions,—ideas and symbols made sacred by religious or political or moral sanction—which by common consent have been raised above the stage of debateableness and made sacrosanct in the thought of the multitude. These conceptions constitute the idols of the forum and of the marketplace, which drug men's minds instead of stimulating them. They silence thought by demanding an immediate emotional or practical response of an invariable type. Reflection has been interdicted in connection with concepts which have reached this status and criticism is anathematized. They thus become, as in the case of much of the technical terminology of sectarian religions, merely cant phrases, employed not to stimulate the development of meaning but solely to provoke a typical habitual response, namely the specific mood or act which tradition has connected with the verbal formulation.

In this system of ideal conceptions, and in the understand-

ing of human speech as well, the function of habit is the same as that which it fulfills in the field of perception and motor reaction. It represents the system of fixed and permanent relations which finds place within each province of mental activity. These highly defined and recurrent aspects of the system of conceptions constitute the basis of rationality in our thinking. Repetition is essential to the organization of the field of consciousness as variation is to its preservation. In proportion as the relations among the mind's objects are ascertained and made familiar through repetition, they cease to occupy the attention. In the mind's procedure they still have a place, but they are neither reflectively formulated on the occasions of their employment, nor do they detain the mind at their occurrence and thus become the center of a new associative system. Conception and equation, formula and deduction follow one another in a typical habit series when they have thus reached full definition and attained final familiarity for the mind which employs them.

The system of relations represented in the multiplication table affords an illustration of this process of habituation. The relations here are simple and invariable, and while the establishment of the system in mind may involve sustained effort and a high degree of selective attention, the tabulation of this series of relations and the study of them by the individual has fulfilled its object only when the mind has been so thoroughly familiarized with the whole system that the product of any two numbers arises immediately and unreflectively upon the presentation of the numbers in question. In the final stage of this development there is no multiplying process interposed between the thought of the numbers and the thought of their product, to which the thinker can point. The procedure has been so mechanized that in the case of the expert a series of such simple operations may be performed without interrupting the continuity of attention to other objects of thought.

Just as in the case of human speech it is essential that the fundamental meanings should be mastered in such a degree that their signification needs not to be established anew on the

occasion of each recurrence, so in the general system of concepts by means of which the mind works, it is indispensable that group after group of formulations should thus be automatized if the mind is to advance in its task of reducing the phenomena of experience to logical order through the application to them of an ascending series of ideal conceptions.

In all phases of the mind's activity, whether it be motor co-ordination, or perception of the external world, or associative thought, the same phenomena are presented. At any stage in its development there is given an existing system of habit-modes which is under continuous extension and organization through a process of selection and reconstruction. The system of existing habit-modes we may call the individual mind; for the latter term is commonly employed to denote the specific characters of the individual,—those mental features which, though they undergo change, present at any time such definite forms that they constitute a synthetic type by which the individual may be recognized and described. The selective and reconstructive modification is the function of individual consciousness, which arises at those points where equilibrium has been disturbed, and mediates the new form of reaction which is in process of formulation. The interaction of individual consciousness and individual mind constitutes individual life, which is a process of continuous re-adaptation in a cyclical type of change, wherein, through the disturbance of equilibrium between an older settled habit and the environment to which it is adapted, an activity of discriminative and selective consciousness is initiated, leading to the establishment of new habit-modes through modification and re-organization of the old in an endless succession.

In this whole process the terminus to which the reconstructive activity tends is unconscious automatism. In its final phase it is an adaptive reaction, in the form of some specific movement or bodily attitude: it is never a system of ideas. The system of ideas, whether feelings of bodily condition, perception of external objects, mental images, or conceptual forms, is that phase of the mind's existence which mediates the formation of habits. The system of ideas cannot

itself exhibit habit; just in so far as habit supervenes the ideal content of experience declines. It is thus not proper to say that the system of ideas as well as the system of movements is subject to habituation. On the contrary, the system of ideas exists in so far, and only in so far, as the conditions of habit-forming fail within any given field of experience. The system of ideas represents the margin of variability in the world of experience at large. It stands for those elements and aspects which are not yet coördinated with, and capable of immediately provoking, appropriate adaptive reactions. The system of ideas thus reflects the outer circle of environmental conditions, the world of problematic relations and unsolved adaptations. It is the field of doubt and hesitation, of stress and struggle, the field within which, though the object of the will has already been formulated, the means to its elaboration have not yet found definition, and the mind is occupied with an incessant vivid representation of the alternative but still dubious courses which the situation suggests.

The vividness of consciousness is intensified wherever the form of habit suffers disturbance, as well as where it is primitively lacking. In the child's pristine experience every detail of those events which in later years we call hum-drum is eagerly welcomed; and if the sense of living experience decline with age, it is because the extension of habit in life has not been accompanied uniformly by a correlative development of interest in novel forms of stimulus. It is conceivable that the system of organized habits should approach so near to the confines of experience as to leave only a negligible element of ideal activity, confining the individual in a narrow round of routine, in which his dull and brutish soul is illuminated by only an inconstant gleam of speculation. It is conceivable also, that in a fortunately born nature the order of experience should remain so full of possible alternatives that not even the most trivial occurrence has completely lost suggestiveness, so that an aura of serious or whimsical speculation surrounds it in the fulgurating mind. Such individuals never grow old, we say; and their youthfulness lies just in this freshness of vision which enables them to avoid

the shackles of intellectual habit, and to maintain a child's originality in their treatment of the increasingly complex phenomena which the course of experience presents.

Duller minds are touched by this deepening and quickening of existence wherever their habitual routine is disturbed, as when a hitherto unconsidered doubt is cast upon some settled belief, or a familiar fact is presented in a novel but consistent way. Whether the sharpened sense of experience be found exhilarating or poignant will depend upon the specific direction of departure from the fundamental habits of life. But, in both cases alike, the experience is characterized by the sudden flooding of a field of organized and habitual attitudes with an acute and vibrant consciousness.

The normal relation of these two systems of factors in mental development may be stated briefly. The system of habits gives to ideal activity its point of origin and its direction: the system of ideas gives to habit a telic value, and maintains its commensurability with an enlarging environment. Without habit experience would be an irrational chaos; without ideas it would have no existence,—for experience is not posited of an organism in virtue of adaptation in general, but only in so far as adaptation constitutes an ideal process determined by a specific aim and a sense of value. Normal development in the individual mind, therefore, is that process of change which leads towards a more complex synthesis of habit-modes and a widened ideal horizon; and the highest type of self is that in which a life of the most intense intellectual activity finds at once its basis and its object in the fullest organization of experience in terms of significant reactions of the will.

STUDIES FROM THE PSYCHOLOGICAL LABOR-
ATORY OF THE UNIVERSITY
OF CALIFORNIA

XVI. TEMPORAL AND ACCENTUAL RHYTHM

BY WARNER BROWN

Perhaps the only undisputed characteristic of rhythm is the impression of regularity which it occasions. Some hold that this impression arises from the regular recurrence, in time, of certain features of the rhythmic series; others claim that the regularity resides in the structure of the elements composing the series; but in either case some regularity is admitted. A rhythm lacking regularity in its structure and failing in the regular repetition of its elements would be no rhythm.

I

The mere repetition of a single undifferentiated movement or sound does not constitute a rhythmic series, properly speaking, and yet such a series offers one of the most satisfactory approaches to the more truly rhythmic forms. Movements either with the voice or by tapping, are easily recorded by the kymograph, and may be measured and studied at leisure. On that account a series of movements can be analyzed to better advantage than a series of sounds.

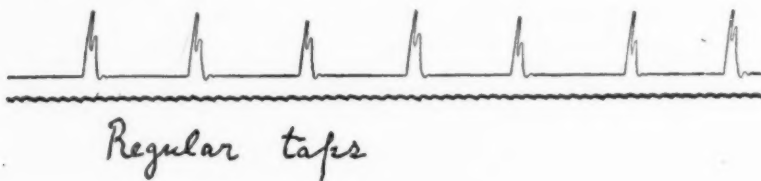


FIG. I.

Fig. I shows a series of regular taps made by the finger. Here regularity is the dominant characteristic. But regularity is seen to be of two distinct sorts. Regularity of

recurrence appears in the duration of the taps and the interval between them, and over against this is regularity in the performance itself, which manifests itself in the force of the movement. In the record the duration is measured horizontally and the force vertically. The degree of regularity

TABLE I

REGULAR TAPS

Showing, for each Subject, the Mean Variation, in per cent., from the average of 20 taps; with regard to the Force and Duration of the taps.

| Subject | Force | Duration |
|------------------------|-------|----------|
| 1. Mr. Bates..... | 6.22 | 3.42 |
| 2. Mr. Detter..... | 9.02 | 6.44 |
| 3. Mr. Dignan..... | 5.78 | 2.66 |
| 4. Miss Fisher..... | 11.79 | 2.40 |
| 5. Mr. Folte..... | 16.90 | 4.28 |
| 6. Mr. Ham..... | 5.90 | 3.12 |
| 7. Miss Hendee..... | 10.80 | 5.69 |
| 8. Mr. Jackson..... | 8.68 | 3.81 |
| 9. Miss Noteware..... | 6.78 | 3.03 |
| 10. Mr. Robinson..... | 5.94 | 3.37 |
| 11. Miss Replogle..... | 15.50 | 10.00 |
| 12. Mrs. Stanley..... | 13.60 | 3.31 |
| 13. Miss Umphred..... | 11.90 | 3.50 |
| 14. Miss Way..... | 10.95 | 4.38 |
| 15. Mr. Whisman..... | 5.92 | 4.99 |
| Average..... | 9.71 | 4.36 |

is found by computing the mean variation from the average of a number of successive movements.¹ Table I. shows the variation in force and duration of a series of twenty taps with the index finger on the rubber head of a drum connected with a recording tambour. The subjects² were requested to tap as regularly as possible in time and force and at a rate of their own choosing. On the whole, averaging the records of the subjects, these taps vary more than twice as much in force as in time. In other words their duration is more than twice as regular as their structural form. For some persons

¹ The measurements of the movements themselves are of no importance in the present connection, and for the sake of clearness only the variations from their average are mentioned. Throughout this paper the mean variation is expressed in per cent. of the quantity which varies.

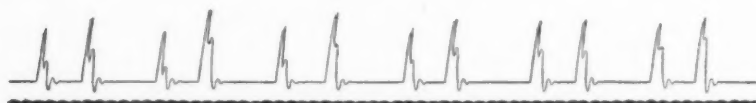
² I am indebted to fifteen of my students in the University of California summer session of 1910 for the records upon which this report is based.

the variation in time is more nearly equal to that in force, but in no case is there less variation in force than in time.

It is evident that this series tends to conserve a regular succession of its elements rather than regularity in their form. But this sacrifice of form to duration occurs in a series which does not profess to have much form, and the further question arises whether the same thing would hold in a truly rhythmic series.

II

Fig. 2 shows a series of taps in rhythm. The subjects were instructed to tap in a natural manner in an iambic rhythm, and the explanation was made that this rhythm has the second beat accented or longer than the first, but no



Iambic taps

FIG. 2.

indication was given as to the relative importance of the temporal or accentual features. Table II. shows for the fifteen subjects the variation in force and duration of the first (short) and second (long) tap, based on the average of a series of ten pairs of taps. The same table shows the variation in total duration of the rhythmic element (the foot, or sum of two successive taps) and of the total force exerted in the element as measured by the sum of the forces exerted on the two parts of it. This table also gives a measure of the structural constancy of the elements in the series both in force and time. This is shown in the column headed "ratio" by the variation, in the two respects, of the ratio between the two parts of the foot when the long or accented part is divided by the short part.¹

The more complicated performance demanded by this part of the experiment brings out more individual differences

¹ Again only the variations are considered. The actual ratios will be spoken of later on.

TABLE II

IAMBIC TAPS

Showing for each Subject the Mean Variation in per cent. from the average of 10 pairs of taps, with regard to the Force and Duration of the taps. The variation is given for the first or Short tap, for the second or Long tap, for the Sum of the two taps, and for the Ratio found by dividing the short into the long tap.

| Subject | Short | | Long | | Sum | | Ratio | |
|----------|-------|------|-------|------|-------|------|-------|------|
| | F | D | F | D | F | D | F | D |
| 1 | 5.71 | 5.64 | 1.76 | 5.94 | 2.98 | 3.31 | 5.32 | 3.48 |
| 2 | 9.91 | 5.25 | 6.64 | 5.92 | 4.98 | 4.19 | 14.16 | 8.32 |
| 3 | 9.17 | 4.55 | 6.02 | 2.60 | 4.02 | 2.20 | 17.44 | 6.35 |
| 4 | 12.71 | 5.17 | 9.02 | 3.56 | 10.07 | 3.34 | 11.83 | 6.04 |
| 5 | 6.21 | 6.22 | 5.83 | 3.43 | 3.46 | 4.31 | 11.41 | 5.97 |
| 6 | 16.32 | 4.48 | 5.49 | 2.66 | 6.06 | 2.64 | 19.11 | 4.62 |
| 7 | 15.00 | 5.24 | 7.81 | 6.24 | 6.43 | 4.54 | 14.50 | 5.82 |
| 8 | 12.98 | 6.32 | 8.92 | 6.54 | 4.10 | 3.79 | 19.38 | 9.92 |
| 9 | 5.28 | 4.59 | 6.18 | 5.70 | 4.11 | 2.86 | 6.91 | 4.68 |
| 10 | 7.81 | 2.39 | 5.42 | 4.90 | 4.68 | 2.35 | 10.75 | 6.74 |
| 11 | 9.83 | 4.02 | 10.56 | 6.14 | 6.36 | 5.32 | 16.42 | 4.69 |
| 12 | 14.60 | 4.44 | 6.54 | 2.19 | 8.31 | 2.72 | 12.82 | 5.17 |
| 13 | 11.40 | 3.40 | 7.31 | 4.18 | 8.31 | 3.20 | 10.80 | 5.51 |
| 14 | 10.05 | 6.08 | 6.00 | 3.87 | 3.53 | 4.57 | 14.60 | 7.26 |
| 15 | 9.14 | 4.48 | 4.78 | 4.25 | 5.04 | 3.82 | 10.42 | 4.04 |
| Average. | 10.41 | 4.82 | 6.55 | 4.54 | 5.50 | 3.54 | 12.66 | 5.91 |

between the subjects, but in the long run and with very few exceptions the indications of the regular tap series are borne out by the rhythmic series. Whether we consider the short initial stroke, the long accented stroke, or their sum (the whole foot), there is greater variation in force than in time. It should be noted, however, that except for the initial stroke, there is less difference between time and force than in the case of regular taps. Taking the whole foot as a basis for comparison with the regular taps of the first series it is seen that the introduction of rhythmic form has tended to steady the movements both in time and force, but has reduced the variation in force more than in time.

The column headed 'ratio' (Table II.) shows the maintenance of internal structure in the foot or rhythmic unit. On the whole the temporal structure is maintained twice as well as the accentual structure. In neither respect is the internal structure preserved half as well as the uniformity of the rhythmic unit; the ratios vary twice as much as the feet.

III

The third part of the experiment (Fig. 3 and Table III.) reports a series of syllables spoken in iambic tetrameter rhythm and recorded by a tambour in the manner indicated in an earlier paper of the writer's.¹ The subjects were instructed to speak, in a natural rhythm, the written line:

Ta tá, ta tá, ta tá, ta tá;

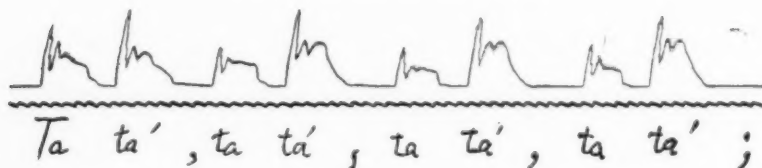


FIG. 3.

TABLE III

IAMBIC SYLLABLES

Showing for each subject the Mean Variation in per cent. from the average of ten pairs of syllables from the first foot of the iambic tetrameter line Ta tá, ta tá, ta tá, ta tá; with regard to Force and Duration. The variation is given for the first two syllables separately, for their Sum, and for the Ratio found by dividing the first into the second.

| Subject | Ta | | tá | | Sum | | Ratio | |
|----------|-------|-------|-------|-------|-------|------|-------|-------|
| | F | D | F | D | F | D | F | D |
| 1 | 10.62 | 4.14 | 12.56 | 3.82 | 11.18 | 2.76 | 5.94 | 9.05 |
| 2 | 9.22 | 4.29 | 8.84 | 5.27 | 6.23 | 3.80 | 9.79 | 5.45 |
| 3 | 36.00 | 8.85 | 18.38 | 13.80 | 23.40 | 9.22 | 22.00 | 8.32 |
| 4 | 40.30 | 10.37 | 20.30 | 7.00 | 22.45 | 6.33 | 43.60 | 11.22 |
| 5 | 15.92 | 7.34 | 11.48 | 2.96 | 11.82 | 2.44 | 15.60 | 8.58 |
| 6 | 24.70 | 4.42 | 30.80 | 8.08 | 23.50 | 3.94 | 27.40 | 12.65 |
| 7 | 13.80 | 11.68 | 9.14 | 6.26 | 4.67 | 7.10 | 22.10 | 8.13 |
| 8 | 13.60 | 7.04 | 12.50 | 5.51 | 11.80 | 4.90 | 12.63 | 5.76 |
| 9 | 28.00 | 6.55 | 19.50 | 4.77 | 17.00 | 4.06 | 24.70 | 8.52 |
| 10 | 16.77 | 7.23 | 15.43 | 12.51 | 15.25 | 8.22 | 20.50 | 15.18 |
| 11 | 15.30 | 10.90 | 16.40 | 8.27 | 15.50 | 4.39 | 9.68 | 16.65 |
| 12 | 13.55 | 5.67 | 26.84 | 7.00 | 17.00 | 5.57 | 22.10 | 5.81 |
| 13 | 34.90 | 21.40 | 37.20 | 11.24 | 25.30 | 5.39 | 43.70 | 28.30 |
| 14 | 17.93 | 11.00 | 16.82 | 6.81 | 14.50 | 5.97 | 22.40 | 8.23 |
| 15 | 25.80 | 6.63 | 11.53 | 4.13 | 15.43 | 4.41 | 23.50 | 10.76 |
| Average. | 21.09 | 8.50 | 17.81 | 7.16 | 15.67 | 5.23 | 21.71 | 10.84 |

like a line of verse, and then to repeat the same line as another verse and so on until stopped. The first foot of each of ten

¹'Time in English Verse Rhythm,' *Archives of Psychol.*, No. 10, 1908.

verses was measured for the record. The force is the height of the consonant, and the duration is the time from the beginning of one consonant to the beginning of the next. Here all the conditions, rhythmic form, motor performance, and experimental conditions for making the record, were more complicated than in the case of taps. The difficulty of securing an adequate record of the force of the vocal utterance is a particularly serious source of error,¹ and yet when we remember that the syllables to be measured are all made up of the same letters or sounds the data may be considered sufficiently reliable for our purposes. As compared with the iambic taps there is a very large increase in variability in all directions, and while the larger variation in force may be attributable to instrumental difficulties, the loss of control in time is beyond question. This greater variability indicates that the greater elaborateness of the rhythm or the change in the motor mechanism, or the experimental embarrassments (which were not grave) singly, or together, interfered with the rhythm in respect both to internal structure and to the relation of the units to one another.

Yet apart from greater irregularity, the spoken iambs do not differ materially from those that were tapped, when we consider that the blame for the relatively greater variability in force can properly be laid to instrumental difficulties. In Table II. the difference between time and force was more noticeable in the ratio column than in any other, but in the present case the ratios differ in force only twice as much as in duration, while in the other columns the force varies nearly three times as much as the duration. This is not to be taken as improvement in the relative regularity of structure as regards force, but again as a peculiarity of the recording device. This device might well record the relative emphasis, *i. e.*, the ratio of force, within the foot, while it would not report correctly the emphasis in different feet, or over any considerable length of time.

¹ See 'Time in Eng. Verse Rhythm,' p. 22; and compare Bourdon in *L'année psychologique*, IV., 1898, p. 370.

IV

In the fourth part of the experiment the subjects were instructed to recite into the recording apparatus in a natural but forceful manner the nursery verses:

Pease porridge hot,
Pease porridge cold,
Pease porridge in the pot nine days old.

TABLE IV
PEASE PORRIDGE

Showing for each Subject the Mean Variation in per cent. from an average of 10 measurements of the words Pease porridge cold; with regard to Force and Duration. The Variation is shown for each word separately, for the Sum of the three words, and for the Ratio found by dividing the first word into the second.

| Subject | Pease | | Porridge | | Cold | | Sum | | Ratio | |
|---------|-------|-------|----------|-------|-------|-------|-------|------|-------|-------|
| | F | D | F | D | F | D | F | D | F | D |
| 1 | 15.28 | 6.06 | 10.86 | 4.02 | 14.29 | 7.74 | 9.75 | 3.87 | 14.68 | 3.08 |
| 2 | 23.20 | 11.55 | 29.60 | 7.11 | 22.40 | 6.01 | 21.20 | 5.71 | 32.80 | 14.05 |
| 3 | 12.40 | 8.87 | 13.00 | 8.28 | 10.17 | 6.80 | 8.07 | 3.85 | 22.05 | 14.51 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 1 | 10.90 | 1 | 8.30 | 1 | 6.37 | 1 | 6.74 | 1 | 12.77 |
| 6 | 25.15 | 9.77 | 37.10 | 4.11 | 31.85 | 7.76 | 22.75 | 5.54 | 46.70 | 8.01 |
| 7 | 26.60 | 7.46 | 15.80 | 3.66 | 15.80 | 3.45 | 16.30 | 3.16 | 22.80 | 7.25 |
| 8 | 17.15 | 13.50 | 17.90 | 7.26 | 18.00 | 5.54 | 14.53 | 4.87 | 15.20 | 17.70 |
| 9 | 16.00 | 6.00 | 16.60 | 3.84 | 31.70 | 8.00 | 17.20 | 3.84 | 15.40 | 4.03 |
| 10 | 17.88 | 6.50 | 16.67 | 6.24 | 40.20 | 8.04 | 16.93 | 3.56 | 25.60 | 9.85 |
| 11 | 20.20 | 8.98 | 22.20 | 11.18 | 25.80 | 3.96 | 16.60 | 3.36 | 23.00 | 19.30 |
| 12 | 11.90 | 4.72 | 10.70 | 1.98 | 32.40 | 4.04 | 7.71 | 1.65 | 16.65 | 4.66 |
| 13 | 25.70 | 7.05 | 28.00 | 5.61 | 32.40 | 8.92 | 15.40 | 4.72 | 43.00 | 10.60 |
| 14 | 9.58 | 6.02 | 13.40 | 6.87 | 31.20 | 12.40 | 11.15 | 6.91 | 19.25 | 9.64 |
| 15 | 24.80 | 6.19 | 17.60 | 3.44 | 25.70 | 6.81 | 13.00 | 4.40 | 38.60 | 6.78 |
| Av. | 18.91 | 8.11 | 19.19 | 5.86 | 25.54 | 6.84 | 14.66 | 4.44 | 25.82 | 10.16 |

This was repeated a number of times. The record, given in Fig. 4 and Table IV., shows the variation in force (height

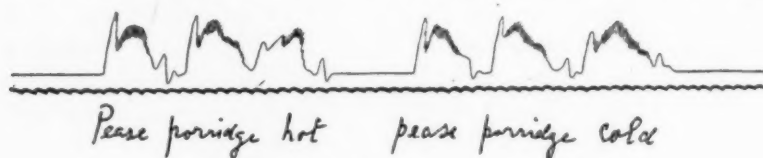


FIG. 4.

of the initial consonants p, p and c) in the phrase 'Pease porridge cold,' and in time from the beginning of pease to the

¹ No legible record.

beginning of porridge, from the beginning of porridge to the beginning of cold, and in the duration of the word cold to the end of the final consonant. It also shows the variations in time and force for the whole phrase of three words and in the ratios for the first and second words of the phrase. The variations are based on the average of ten records except that in three cases there were only eight available records. As elsewhere the variations are expressed in per cent. of the quantities involved.

With regard to either the time or force, the variations in this series are about as large for the separate parts of the foot as in the iambic syllable (ta tá) series. The variation in force exceeds the variation in time in about the same proportion as in that series. But the variations for the foot as a whole fall below those for the iambic syllables. In duration these feet are about as regular as the regular taps of the first series. The ratios present a different aspect, for while in duration they are slightly more regular than the iambic syllables, they are less regular in force. In comparison with the series of iambic syllables the 'Pease porridge' series is more regular in recurrence in regard to both the time and force of the total foot. The 'Pease porridge' series has also a more regular internal structure (ratio) in regard to time but not in regard to force. Loss of control over the relative force of the movements is very evident in even a superficial inspection of the 'Pease porridge' records. The relative force of the two p's often undergoes a complete reversal from verse to verse. The rhythm of this verse is of course irregular or even amorphic but it is of a very distinctly temporal type, giving, all the disturbing factors being considered, very great regularity in the matter of recurrence, together with a relatively high degree of regularity in internal structure so far as the time relations are concerned.

With these concrete examples from which to start we are now in a position to discuss with more understanding the temporal and accentual features in any rhythm. The first point to be observed is that all recurrence is a temporal

matter. A rhythm is temporal in so far as there is any regular return of similar features. But at the same time such a rhythm will also be accentual since there must always be points of emphasis whose return can be marked. At this stage of the discussion the question to be answered is: Which is fundamental to the rhythm; the uniform time of recurrence, or the uniform character of the thing that recurs? Assuming a reliable method of measuring both the thing and its rate of recurrence I propose the variability as a test in this question. If the movements or sounds vary in intensity more than in duration or more than the interval separating them, I submit that the rhythm is primarily temporal. No very extended argument seems to be required in support of this view, for regularity is essential to rhythm, and if the regularity is predominantly in the time relations the rhythm may be presumed to have its seat there also. Accent may be a necessary feature but it is not the distinctive feature in the rhythms examined for this study.

But we can not stop the discussion on the level of mere recurrence; that would be to stop with the whole feet, ignoring their parts. We can not consider the mere intensity and duration of the item which recurs; we must also consider its individual make-up or structural character. This puts us on the second level, that of the structure of the elements composing the rhythm. Here we find again intensities and durations, or to speak more accurately, relations of intensity and duration. May it not be that we shall find in one or the other of these relations something that will present greater regularity than the mere recurrence of the elements? If so we may look here for the essence of the rhythm.

On the surface of the returns the ratios which represent these relations appear to be more variable than the periods of recurrence. But as the writer has stated before,¹ this view although probably correct can not be taken as final, because the ratios are apparently incommensurable with the actual durations. But we can face this difficulty fairly, and still say that on this second level of structural form, consider-

¹ 'Time in English Verse Rhythm,' p. 67.

ing the ratios independently, it is in the temporal structure and not in the accentual structure that we find the greater regularity. If the fundamental regularity does reside in the arrangement of the parts within the units rather than in the recurrence of these units, it is still to be sought in the arrangement of the parts in time. In any event the predominant regularity on either level is a temporal regularity.

V

A somewhat different method of attack leads to the same conclusion. If, in Table V., we consider the actual ratios which represent the structure of the elements, we find that the ratios for force of movement are different from the ratios

TABLE V

RATIOS

Showing for each Subject the average absolute amount of the Ratio found by dividing the first tap or syllable into the second; with regard to Force and Duration.

| Subject. | Iambic Taps Cf. Table II | | Ta tá Cf. Table III | | Pease porridge Cf. Table IV | |
|----------|-----------------------------|------|------------------------|------|--------------------------------|------|
| | F | D | F | D | F | D |
| 1 | 1.22 | 1.78 | 1.68 | 2.18 | 1.09 | 1.10 |
| 2 | 1.29 | 2.45 | 1.23 | 1.96 | .86 | 1.14 |
| 3 | 1.38 | 1.71 | 1.89 | 2.56 | 1.14 | 1.33 |
| 4 | 1.57 | 2.52 | 2.46 | 2.56 | — | — |
| 5 | 1.28 | 1.73 | 2.24 | 2.93 | — | 1.14 |
| 6 | 1.87 | .95 | 1.55 | 1.71 | 1.02 | 1.14 |
| 7 | 1.87 | 1.61 | 1.92 | 2.64 | .98 | 1.09 |
| 8 | 1.58 | 1.19 | .94 | 1.91 | .98 | 1.12 |
| 9 | 1.09 | 1.79 | 2.44 | 3.06 | .99 | 1.02 |
| 10 | 1.24 | 1.07 | 1.53 | 2.47 | .55 | .94 |
| 11 | 1.62 | 2.94 | 1.05 | 2.13 | .93 | 1.16 |
| 12 | 1.27 | 2.10 | 1.14 | 2.00 | .72 | 1.05 |
| 13 | 1.64 | 1.82 | 2.82 | 2.84 | 1.16 | 1.08 |
| 14 | 1.17 | 1.96 | 1.77 | 2.22 | .67 | 1.13 |
| 15 | 1.52 | 2.47 | 2.11 | 3.31 | .86 | 1.49 |
| Average. | 1.44 | 1.87 | 1.78 | 2.43 | .92 | 1.14 |

for duration of movement. In both of the iambic series the time-ratios are larger than the force-ratios. That is to say, the typical iambic structure with the second part outweighing the first part is more adequately or fully carried out in time than in stress. If the essence of the rhythm is on the second level, in the arrangement of the parts within the rhythmic

unit, then again the arrangement in time satisfies the requirements more fully.

No inferences can be drawn from the absolute ratios of the 'Pease porridge' records because there is no evidence that this was meant by the speakers to be an iambic rhythm. It has some of the ear-marks of a trochaic rhythm¹ and in that case we do not know whether a larger or smaller ratio stands for the typical rhythm. In fact the absolute ratio fails when applied to verse rhythms because of the fact here illustrated that the time-ratio is determined in such cases by the necessary time of uttering the words. The second word in this verse appears to be the second element in a trochaic foot; it sounds so to the ear and its initial consonant shows in the record less stress, on the average, than the initial consonant of the first word; and yet it takes longer to say the longer and more complex second word. In verse there are no typical time-ratios and the force-ratios are not easily measured. With this exception the evidence from the absolute ratio furnishes a valuable check upon the evidence from the relative variabilities.

These results are presented with the hope of arousing interest in what appears to me to be a promising method for the analysis of some of the fundamental questions regarding the basis of rhythmic actions and impressions. The results themselves, so far as they go, indicate as I think, that the time aspects are fundamental and that the accentual features while necessary are not at the root of the phenomena.

¹ *Op. cit.*, p. 55.

XVII. SOME PREFERENCES BY BOYS AND GIRLS AS SHOWN IN THEIR CHOICE OF WORDS

BY M. I. STOCKTON

The broader purpose of the experiments reported in this paper was to obtain light upon possible differences in the affective life of children at different ages, and especially upon any differences between boys and girls. The present experiments were limited, however, to a study of the difference between boys and girls as shown in their choice between time and space words; between words expressing activity and those expressing passivity; between words relating to dress and those relating to food; between verbs and adjectives.

These experiments were suggested by the conclusions stated in Mrs. Manchester's paper on 'Unreflective Ideas of Men and Women.'¹ The question in her study was whether there is any difference between college men and women in their unreflective ideas. From the results of her experiment she drew the following general conclusions:

1. The surface ideas of men and women pertain to objects which are familiar and interesting.
2. The dynamic aspect of objects is more attractive to men, while the static or completed aspect appeals more to women.
3. Time as a factor enters more largely into the surface ideas of men; space is more often a prominent feature of the surface ideas of women.
4. Men make a greater use of abstract terms, while women show a preference for concrete and descriptive words.

The present experiments were carried out in all the grades, above the low second, of the Bay Grammar School, Oakland, Cal. The accompanying table (Table A) gives the age, number and distribution of the pupils participating.

¹ PSYCHOLOGICAL REVIEW, Vol. 12 (1905), p. 50.

Method.—It was thought that if a pair of words of equal difficulty and familiarity were offered, one of which was to be selected, although several motives might affect the choice, yet perhaps there might, after elimination and check, be discovered some clue to the attractiveness of the ideas themselves. Four lists of twenty pairs of words were selected. In the first list, each pair was composed of a time word and a space word; in the second list, of a word denoting activity and one denoting passivity; in the third list, of one referring to dress and one referring to food; in the fourth list, of a verb and an adjective.

TABLE A

| Grade | Average Number of Pupils Participating in the Four Sets of Experiments | | Average Age | |
|-------|--|-------|-------------|-------|
| | Boys | Girls | Boys | Girls |
| B2 | 21 | 19 | 9.3 | 8.6 |
| A3 | 20 | 17 | 10.1 | 9.3 |
| B3 | 14 | 17 | 10.9 | 9.3 |
| A4 | 21 | 17 | 10.9 | 11 |
| B4 | 9 | 8 | 12.4 | 11.7 |
| A5 | 6 | 17 | 11.3 | 12.1 |
| B5 | 11 | 15 | 13.9 | 12.1 |
| A6 | 18 | 12 | 13.3 | 12.9 |
| B6 | 4 | 8 | 13.6 | 14 |
| A7 | 14 | 13 | 13.6 | 12.9 |
| B7 | 6 | 9 | 14.5 | 14 |
| A8 | 4 | 6 | 14.6 | 14.3 |
| B8 | 2 | 4 | 15.6 | 15.3 |

Each pair of words was written, one directly under the other, on a large card which every pupil could see distinctly when the teacher showed it to the class. The cards were numbered so that the words could be presented in order. The words were so written that if a time word was first on one card, a space word was first on the next following; a time word on the third and so on. In this way, any preference due to the position of the word on the card would be offset. Such an order was carefully followed in each of the four lists, as will be seen by glancing at the words on pages 349 and 350.

Before the cards were presented, paper was distributed to the pupils. They were told to write only one of the two words that appeared on each card. No further information concerning the work was given. With the exception of the

third set of papers from the eighth grade, the words were written by the pupils of the twelve different classes at the same hour on each of the four days.

The lists containing time and space words and words denoting activity and passivity were given on the first day. These have been designated Set I. Set II. was given five weeks later and contained the list of words pertaining to dress and food and the list of verbs and adjectives. Set III. was composed of the words of Set I, but the order of the words of each pair was reversed. In this way, a time word that had been first of a pair in Set I., was second of the same pair in Set III. By this double check—that is by alternating within the set itself the class of word that appeared first on each card of the twenty, and by reversing in Set III. the position of each word in its pair as it appeared in Set I. — any influence which might be due to preference for a word merely because it was first or second in its pair would probably in the long run

| LIST 1 Time and Space Words | | LIST 2 Words Denoting Activity and Passivity | |
|--------------------------------|-----------|---|----------|
| mile | little | run | romp |
| year | month | sit | hush |
| always | soon | rest | calm |
| under | tall | busy | move |
| big | down | swim | lively |
| now | daily | still | softly |
| later | tomorrow | sleep | silent |
| small | thickness | work | hurry |
| where | width | talking | chatter |
| when | quick | listen | slumber |
| hour | seldom | quiet | patient |
| high | narrow | throw | speaking |
| inch | above | dig | climb |
| slow | fast | wait | float |
| early | yesterday | idle | grow |
| large | outside | jump | push |
| below | broad | play | day |
| today | until | ride | night |
| then | time | evening | standing |
| there | space | morning | chasing |

LIST 3
Words Relating to Dress and Food

| | |
|-----------|---------|
| dress | collar |
| grapes | cheese |
| nut | banana |
| cap | ribbon |
| hat | velvet |
| pie | apple |
| berries | supper |
| gloves | cloak |
| coat | silk |
| cake | food |
| bread | beef |
| skirt | lace |
| vest | tailor |
| meat | turkey |
| fruit | pudding |
| shoes | necktie |
| stockings | button |
| potatoes | carrot |
| butter | dinner |
| woolen | shawl |

LIST 4
Verbs and Adjectives

| | |
|--------|--------|
| build | sing |
| little | poor |
| fresh | old |
| threw | buy |
| give | sailed |
| hot | happy |
| large | green |
| grow | lived |
| tell | sold |
| good | glad |
| rich | long |
| pick | make |
| looked | run |
| short | red |
| sweet | kind |
| think | jump |
| follow | slept |
| sunny | small |
| fine | merry |
| eat | break |

be compensated. The third set was presented two weeks after the second set. Set IV. contained the words of Set II. in reverse order and was given three weeks later than Set III.

The pupils of the A second grade because of insufficient power of writing were unsuited to the experiment; so the B second grade is the youngest class employed, and is referred to simply as the second grade. There were so few pupils in the eighth grade that the results of the two divisions together have been given as the eighth grade. The work of the A fourth grade was interrupted on two mornings, so there is only one set of papers for the list of verbs and adjectives and for the list containing words denoting activity and passivity.

Many difficulties beset one in preparing the lists of words. There were serious limitations placed upon selection by the difference in ability of the various classes. It was necessary that the two words of a pair, fairly intelligible and within the vocabulary of the pupils, should be of the same length

and of the same degree of difficulty in writing. Although much time was spent in preparing the lists, it is impossible to feel that they are entirely satisfactory or beyond criticism.

The results are arranged in Tables I. to IV. which show the percentage of each class of words selected by the boys and girls respectively in the different grades and also the percentage of first and second words selected in the same lists. The percentages are given for each set of papers obtained from each of the four lists of words and also the average percentage of the two sets.

In Table V., the total number of each class of words selected by the twelve grades is given with the corresponding number of first and second words chosen. The percentage selected is also shown. The more significant figures are those given as percentages of the different classes of words selected. The total number of words is of less value since the proportion of boys and of girls varies in the different grades.

Plates A to D inclusive give in different form the same results as are given in Tables I. to IV. The ordinates represent the percentages of preference; the abscissæ represent in order the different school grades. The average value of each curve for all twelve grades is also shown in each table by the horizontal lines; *e. g.*, the horizontal line composed of a dot and a dash in Plate A represents the average selection of time words for the twelve grades for the boys,—having a value of 53.9 per cent. Plate E shows the average percentage of the different classes of words and of first and second words for the twelve grades combined.

Let us consider, first, what conclusions one is warranted in drawing with regard to the more limited problem of this experiment; and later the relation of these results to the larger field will be of interest.

The averages of the two sets in Tables I.—IV. are the significant figures; for any apparent preference due merely to the order of the words is probably eliminated by the alternation and reversal of words explained on page 348. From Table I. and its graphic presentation in Plates A and E, one

TABLE I
PERCENTAGE OF WORDS CHOSEN

| Character of the Word | Boys | | | | Girls | | | |
|-----------------------|------|-------|-------|--------|-------|-------|-------|--------|
| | Time | Space | First | Second | Time | Space | First | Second |
| Second Grade. | | | | | | | | |
| First set. | 54.2 | 45.8 | 43.9 | 56.1 | 48.6 | 51.4 | 50.5 | 49.5 |
| Third set. | 49.6 | 50.4 | 42.9 | 57.1 | 50.4 | 49.6 | 62.1 | 37.9 |
| Average. | 51.8 | 48.2 | 43.4 | 56.6 | 49.5 | 50.5 | 56.3 | 43.7 |
| A Third Grade. | | | | | | | | |
| First set. | 53.7 | 46.3 | 56.3 | 43.7 | 53.1 | 46.9 | 62.7 | 37.3 |
| Third set. | 57.4 | 42.6 | 60.4 | 39.6 | 53.3 | 46.7 | 64.2 | 35.8 |
| Average. | 55.5 | 44.5 | 58.4 | 41.6 | 53.2 | 46.8 | 63.4 | 36.6 |
| B Third Grade. | | | | | | | | |
| First set. | 55.4 | 44.6 | 37.6 | 62.4 | 52.5 | 47.5 | 37.2 | 62.8 |
| Third set. | 51.0 | 49.0 | 69.2 | 30.8 | 51.0 | 49.0 | 69.2 | 30.8 |
| Average. | 53.2 | 46.8 | 53.4 | 46.6 | 51.7 | 48.3 | 53.2 | 46.8 |
| A Fourth Grade. | | | | | | | | |
| First set. | 56.2 | 43.8 | 50.7 | 49.3 | 53.0 | 47.0 | 51.0 | 49.0 |
| Third set. | 54.6 | 45.4 | 58.9 | 41.1 | 43.3 | 56.7 | 53.9 | 46.1 |
| Average. | 55.4 | 44.6 | 54.8 | 45.2 | 48.1 | 51.9 | 52.4 | 47.6 |
| B Fourth Grade. | | | | | | | | |
| First set. | 50.0 | 50.0 | 55.5 | 44.5 | 51.9 | 48.1 | 33.1 | 66.9 |
| Third set. | 50.2 | 49.8 | 72.3 | 27.7 | 53.4 | 46.6 | 46.6 | 53.4 |
| Average. | 50.1 | 49.9 | 63.9 | 36.1 | 52.6 | 47.4 | 39.8 | 60.2 |
| A Fifth Grade. | | | | | | | | |
| First set. | 54.2 | 45.8 | 34.2 | 65.8 | 50.9 | 49.1 | 42.9 | 57.1 |
| Third set. | 50.7 | 49.3 | 62.1 | 37.9 | 52.8 | 47.2 | 47.2 | 42.8 |
| Average. | 52.5 | 47.5 | 48.2 | 51.8 | 51.8 | 48.2 | 50.1 | 49.9 |
| B Fifth Grade. | | | | | | | | |
| First set. | 49.0 | 51.0 | 40.0 | 60.0 | 55.7 | 44.3 | 44.3 | 55.7 |
| Third set. | 56.0 | 44.0 | 61.4 | 38.6 | 55.4 | 44.6 | 59.3 | 40.7 |
| Average. | 52.5 | 47.5 | 50.7 | 49.3 | 55.5 | 44.5 | 51.8 | 48.2 |
| A Sixth Grade. | | | | | | | | |
| First set. | 54.7 | 45.3 | 52.2 | 47.8 | 48.8 | 51.2 | 51.2 | 48.8 |
| Third set. | 51.4 | 48.6 | 63.9 | 36.1 | 53.9 | 46.1 | 70.7 | 29.3 |
| Average. | 53.0 | 47.0 | 58.1 | 41.9 | 51.3 | 48.7 | 60.9 | 39.1 |
| B Sixth Grade. | | | | | | | | |
| First set. | 48.8 | 51.2 | 53.7 | 46.3 | 50.7 | 49.3 | 67.8 | 32.2 |
| Third set. | 55.0 | 45.0 | 55.0 | 45.0 | 50.0 | 50.0 | 74.3 | 25.7 |
| Average. | 51.9 | 48.1 | 54.4 | 45.6 | 50.3 | 49.7 | 71.1 | 28.9 |
| A Seventh Grade. | | | | | | | | |
| First set. | 56.6 | 43.4 | 44.6 | 55.4 | 53.7 | 46.3 | 48.9 | 51.1 |
| Third set. | 58.8 | 41.2 | 64.3 | 35.7 | 55.9 | 44.1 | 67.2 | 32.8 |
| Average. | 57.7 | 42.3 | 54.5 | 45.5 | 54.8 | 45.2 | 58.1 | 41.9 |
| B Seventh Grade. | | | | | | | | |
| First set. | 58.8 | 41.2 | 43.8 | 56.2 | 55.7 | 44.3 | 52.2 | 47.8 |
| Third set. | 47.9 | 52.1 | 68.9 | 31.1 | 69.5 | 30.5 | 58.7 | 41.2 |
| Average. | 53.3 | 46.7 | 56.4 | 43.6 | 62.6 | 37.4 | 55.5 | 44.5 |
| Eighth Grade. | | | | | | | | |
| First set. | 60.8 | 39.2 | 53.3 | 46.7 | 57.9 | 42.1 | 36.7 | 63.3 |
| Third set. | 51.3 | 48.7 | 68.8 | 31.2 | 49.1 | 50.9 | 80.0 | 20.0 |
| Average. | 56.0 | 44.0 | 61.1 | 38.9 | 53.5 | 46.5 | 58.3 | 41.7 |

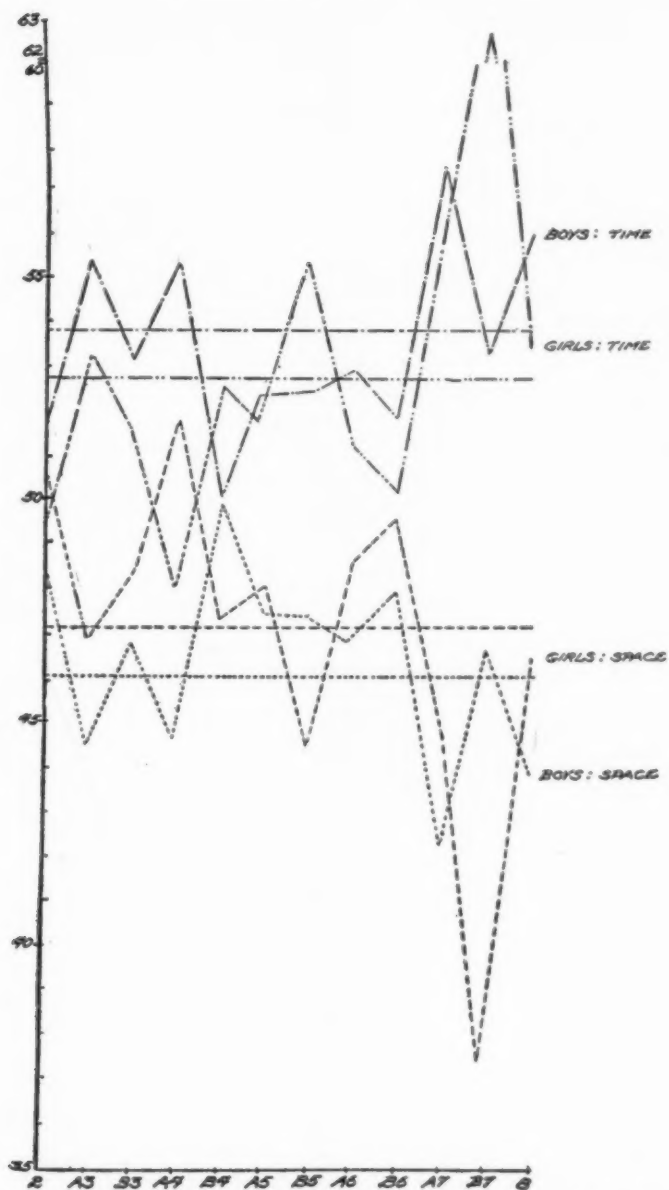


PLATE A. Choice between time-words and space-words, selected by boys and girls respectively. The ordinates indicate in per cent. the amount of preference shown for each of the two groups of words; the abscissæ, the school-grades. (From Table I.)

TABLE II
PERCENTAGE OF WORDS CHOSEN

| Character of the Word | Boys | | | | Girls | | | |
|-----------------------|-----------|------------|-------|--------|-----------|------------|-------|--------|
| | Ac-tivity | Pass-ivity | First | Second | Ac-tivity | Pass-ivity | First | Second |
| Second Grade. | | | | | | | | |
| First set..... | 49.5 | 50.5 | 45.4 | 54.6 | 53.5 | 46.5 | 48.5 | 51.5 |
| Third set..... | 46.8 | 53.2 | 41.6 | 58.4 | 53.2 | 46.8 | 54.8 | 45.2 |
| Average..... | 48.2 | 51.8 | 43.5 | 56.5 | 53.4 | 46.6 | 51.6 | 48.4 |
| A Third Grade. | | | | | | | | |
| First set..... | 51.6 | 48.4 | 60.5 | 39.5 | 51.1 | 48.9 | 57.1 | 42.9 |
| Third set..... | 51.8 | 48.2 | 51.5 | 48.5 | 50.0 | 50.0 | 63.4 | 36.6 |
| Average..... | 51.7 | 48.3 | 56.0 | 44.0 | 50.5 | 49.5 | 60.3 | 39.7 |
| B Third Grade. | | | | | | | | |
| First set..... | 54.5 | 45.5 | 44.7 | 55.3 | 54.2 | 45.8 | 45.1 | 54.9 |
| Third set..... | 41.6 | 58.4 | 63.9 | 36.1 | 49.1 | 50.9 | 58.3 | 41.7 |
| Average..... | 48.0 | 52.0 | 54.3 | 45.7 | 51.6 | 48.4 | 51.7 | 48.3 |
| A Fourth Grade. | | | | | | | | |
| First set..... | 50.9 | 49.1 | 52.9 | 47.1 | 46.0 | 54.0 | 51.0 | 49.0 |
| B Fourth Grade. | | | | | | | | |
| First set..... | 48.3 | 51.7 | 60.6 | 39.4 | 43.1 | 56.9 | 39.4 | 60.6 |
| Third set..... | 51.3 | 48.7 | 67.4 | 32.6 | 36.1 | 63.9 | 57.9 | 42.1 |
| Average..... | 49.8 | 50.2 | 64.0 | 36.0 | 39.6 | 60.4 | 48.6 | 51.4 |
| A Fifth Grade. | | | | | | | | |
| First set..... | 45.4 | 54.6 | 36.2 | 63.8 | 50.1 | 49.9 | 51.2 | 48.8 |
| Third set..... | 53.9 | 46.1 | 61.8 | 38.2 | 48.5 | 51.5 | 51.5 | 48.5 |
| Average..... | 49.6 | 50.4 | 49.0 | 51.0 | 49.3 | 50.7 | 51.4 | 48.6 |
| B Fifth Grade. | | | | | | | | |
| First set..... | 49.5 | 50.5 | 46.5 | 53.5 | 48.1 | 51.9 | 47.5 | 52.5 |
| Third set..... | 58.9 | 41.1 | 50.3 | 49.7 | 49.2 | 50.8 | 53.1 | 46.9 |
| Average..... | 54.2 | 45.8 | 48.4 | 51.6 | 48.6 | 51.4 | 50.3 | 49.7 |
| A Sixth Grade. | | | | | | | | |
| First set..... | 54.5 | 45.5 | 47.5 | 52.5 | 51.2 | 48.8 | 53.5 | 46.5 |
| Third set..... | 50.6 | 49.4 | 70.1 | 29.9 | 48.8 | 51.2 | 42.2 | 57.8 |
| Average..... | 52.5 | 47.5 | 58.8 | 41.2 | 50.0 | 50.0 | 47.8 | 52.2 |
| B Sixth Grade. | | | | | | | | |
| First set..... | 56.2 | 43.8 | 71.2 | 28.8 | 47.1 | 52.9 | 72.8 | 27.2 |
| Third set..... | 54.5 | 45.5 | 48.5 | 51.5 | 43.6 | 56.4 | 73.6 | 26.4 |
| Average..... | 55.4 | 44.6 | 59.8 | 40.2 | 45.4 | 54.6 | 73.2 | 26.8 |
| A Seventh Grade. | | | | | | | | |
| First set..... | 51.7 | 48.3 | 52.3 | 47.7 | 50.4 | 49.6 | 56.1 | 43.9 |
| Third set..... | 57.2 | 42.8 | 59.7 | 40.3 | 45.6 | 54.4 | 56.9 | 43.1 |
| Average..... | 54.5 | 45.5 | 56.0 | 44.0 | 48.0 | 52.0 | 56.5 | 43.5 |
| B Seventh Grade. | | | | | | | | |
| First set..... | 47.5 | 52.5 | 52.5 | 47.5 | 44.3 | 55.7 | 52.8 | 47.2 |
| Third set..... | 49.1 | 50.9 | 70.2 | 29.8 | 43.5 | 56.5 | 57.1 | 42.9 |
| Average..... | 48.3 | 51.7 | 61.4 | 38.6 | 43.9 | 56.1 | 54.9 | 45.1 |
| Eighth Grade. | | | | | | | | |
| First set..... | 52.1 | 47.9 | 49.6 | 50.4 | 48.3 | 51.7 | 39.2 | 60.8 |
| Third set..... | 46.4 | 53.6 | 73.7 | 26.3 | 52.2 | 47.8 | 84.1 | 15.9 |
| Average..... | 49.3 | 50.7 | 61.6 | 38.4 | 50.3 | 49.7 | 61.6 | 38.4 |

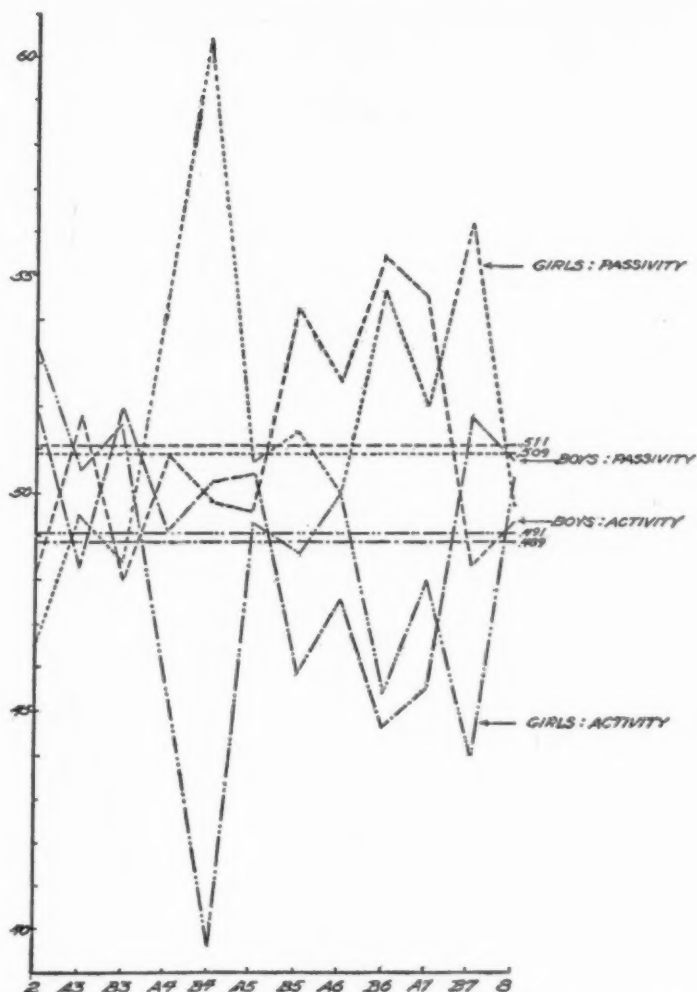


PLATE B. Choice between words denoting activity and passivity by boys and girls respectively. The ordinates indicate in per cent. the preference shown for each of the two groups of words, the abscissæ, the school-grades. (From Table II.)

may conclude that a noticeable predominance of time interest is shown by both boys and girls. There is a slightly greater predominance of time interest among the boys than among the girls. In these same sets of time and space words, there is a predominance of first words in ten grades among the boys and in eleven grades among the girls.

TABLE III
PERCENTAGE OF WORDS CHOSEN

| Character of Word Chosen | Boys | | | | Girls | | | |
|--------------------------|-------|------|-------|--------|-------|------|-------|--------|
| | Dress | Food | First | Second | Dress | Food | First | Second |
| Second Grade. | | | | | | | | |
| Second set. | 50.7 | 49.3 | 60.3 | 39.7 | 50.8 | 49.2 | 56.1 | 43.9 |
| Fourth set. | 48.5 | 51.5 | 39.6 | 60.4 | 37.3 | 62.7 | 51.7 | 48.3 |
| Average. | 49.6 | 50.4 | 49.9 | 50.1 | 44.1 | 55.9 | 53.9 | 46.1 |
| A Third Grade. | | | | | | | | |
| Second set. | 49.9 | 50.1 | 41.3 | 58.7 | 58.1 | 41.9 | 52.7 | 47.3 |
| Fourth set. | 49.7 | 50.3 | 72.6 | 27.4 | 50.8 | 49.2 | 72.1 | 27.9 |
| Average. | 49.8 | 50.2 | 56.9 | 43.1 | 54.5 | 45.5 | 62.4 | 37.6 |
| B Third Grade. | | | | | | | | |
| Second set. | 41.1 | 58.9 | 53.3 | 46.7 | 41.1 | 58.9 | 53.5 | 46.5 |
| Fourth set. | 55.4 | 44.6 | 64.8 | 35.2 | 44.5 | 55.5 | 57.4 | 42.6 |
| Average. | 48.3 | 51.7 | 59.1 | 40.9 | 42.8 | 57.2 | 55.5 | 44.5 |
| A Fourth Grade. | | | | | | | | |
| Second set. | 40.0 | 60.0 | 59.0 | 41.0 | 39.6 | 60.4 | 46.4 | 53.6 |
| Fourth set. | 42.9 | 57.1 | 57.1 | 42.9 | 43.1 | 56.9 | 57.3 | 42.7 |
| Average. | 41.5 | 58.5 | 58.1 | 41.9 | 41.4 | 58.6 | 51.8 | 48.2 |
| B Fourth Grade. | | | | | | | | |
| Second set. | 49.7 | 50.3 | 61.3 | 38.7 | 45.0 | 55.0 | 42.9 | 57.1 |
| Fourth set. | 45.5 | 54.5 | 57.1 | 42.9 | 47.6 | 52.4 | 59.5 | 40.5 |
| Average. | 47.6 | 52.4 | 59.2 | 40.8 | 46.3 | 53.7 | 51.2 | 48.8 |
| A Fifth Grade. | | | | | | | | |
| Second set. | 42.2 | 57.8 | 51.9 | 48.1 | 49.1 | 50.9 | 52.3 | 47.7 |
| Fourth set. | 41.7 | 58.3 | 44.8 | 55.2 | 49.4 | 50.6 | 57.9 | 42.1 |
| Average. | 41.9 | 58.1 | 48.4 | 51.6 | 49.3 | 50.7 | 55.1 | 44.9 |
| B Fifth Grade. | | | | | | | | |
| Second set. | 56.4 | 43.6 | 66.1 | 33.9 | 44.8 | 55.2 | 51.3 | 48.7 |
| Fourth set. | 31.5 | 68.5 | 53.2 | 46.8 | 44.1 | 55.9 | 58.1 | 41.9 |
| Average. | 43.9 | 56.1 | 59.6 | 40.4 | 44.5 | 55.5 | 54.7 | 45.3 |
| A Sixth Grade. | | | | | | | | |
| Second set. | 38.5 | 61.5 | 63.6 | 36.4 | 55.9 | 44.1 | 67.9 | 32.1 |
| Fourth set. | 28.9 | 71.1 | 66.1 | 33.9 | 52.9 | 47.1 | 67.1 | 32.9 |
| Average. | 33.7 | 66.3 | 64.8 | 35.2 | 54.4 | 45.6 | 67.5 | 32.5 |
| B Sixth Grade. | | | | | | | | |
| Second set. | 30.0 | 70.0 | 57.5 | 42.5 | 44.1 | 55.9 | 77.4 | 22.6 |
| Fourth set. | 20.0 | 80.0 | 65.0 | 35.0 | 45.0 | 55.0 | 67.5 | 32.5 |
| Average. | 25.0 | 75.0 | 61.3 | 38.7 | 44.5 | 55.5 | 72.5 | 27.5 |
| A Seventh Grade. | | | | | | | | |
| Second set. | 37.6 | 62.4 | 56.2 | 43.8 | 37.7 | 62.3 | 45.8 | 54.2 |
| Fourth set. | 18.6 | 81.4 | 53.6 | 46.4 | 24.1 | 75.9 | 55.5 | 44.5 |
| Average. | 28.1 | 71.9 | 54.9 | 45.1 | 30.9 | 69.1 | 50.6 | 49.4 |
| B Seventh Grade. | | | | | | | | |
| Second set. | 52.5 | 47.5 | 50.8 | 49.2 | 53.6 | 46.4 | 50.3 | 49.7 |
| Fourth set. | 34.2 | 65.8 | 42.5 | 57.5 | 40.6 | 59.4 | 57.3 | 42.7 |
| Average. | 43.4 | 56.6 | 46.6 | 53.4 | 47.1 | 52.9 | 53.8 | 46.2 |
| Eighth Grade. | | | | | | | | |
| Second set. | 45.8 | 54.2 | 57.5 | 42.5 | 47.1 | 52.9 | 53.8 | 46.2 |
| Fourth set. | 38.8 | 61.2 | 71.2 | 28.8 | 45.9 | 54.1 | 58.7 | 41.3 |
| Average. | 42.3 | 57.7 | 64.4 | 35.6 | 46.5 | 53.5 | 56.3 | 43.7 |

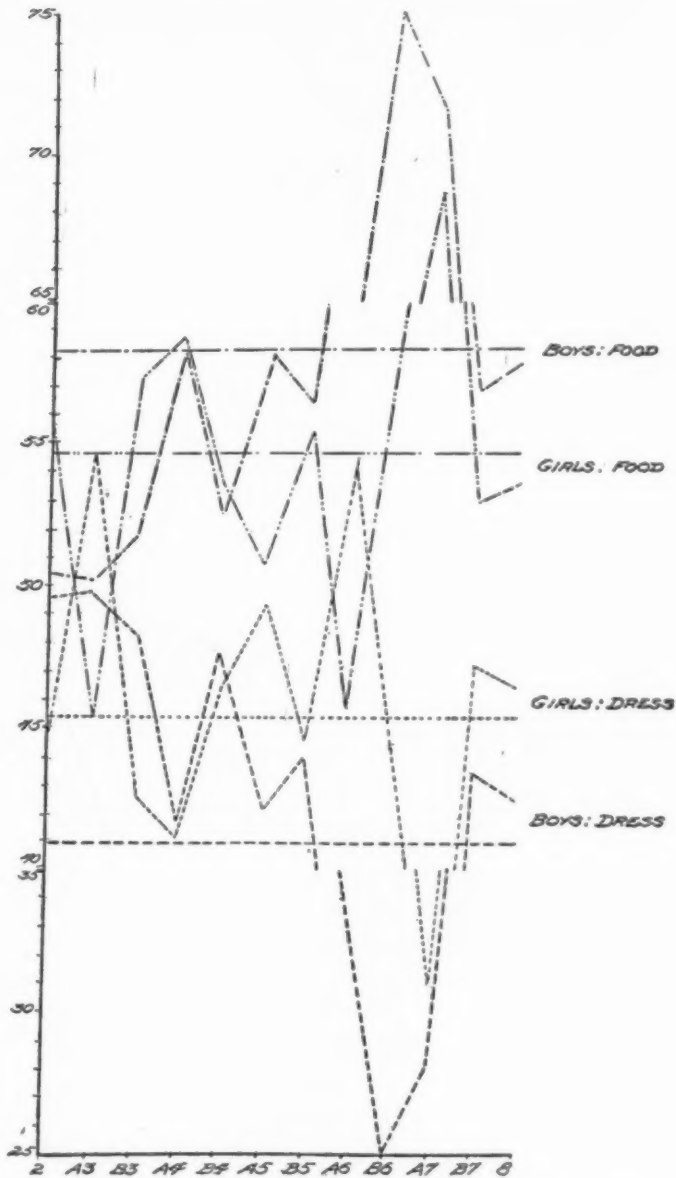


PLATE C. Choice between words denoting food and dress, by boys and girls respectively. The ordinates indicate in per cent. the amount of preference shown for each of the two groups of words; the abscissæ, the school-grades. (From Table III.)

TABLE IV
PERCENTAGE OF WORDS CHOSEN

| Character of Word Chosen | Boys | | | | Girls | | | |
|--------------------------|-------|------------|-------|--------|-------|------------|-------|--------|
| | Verbs | Adjectives | First | Second | Verbs | Adjectives | First | Second |
| Second Grade. | | | | | | | | |
| Second set. | 45.8 | 54.2 | 58.7 | 41.3 | 46.8 | 53.2 | 59.5 | 40.5 |
| Fourth set. | 45.3 | 54.7 | 40.8 | 59.3 | 36.4 | 63.6 | 54.4 | 45.6 |
| Average. | 45.5 | 54.5 | 49.7 | 50.3 | 41.6 | 58.4 | 56.9 | 43.1 |
| A Third Grade. | | | | | | | | |
| Second set. | 43.1 | 56.9 | 55.4 | 44.6 | 43.4 | 56.6 | 62.4 | 37.6 |
| Fourth set. | 45.6 | 54.4 | 69.7 | 30.3 | 46.6 | 53.4 | 80.1 | 19.9 |
| Average. | 44.4 | 55.6 | 62.5 | 37.5 | 45.0 | 55.0 | 71.3 | 28.7 |
| B Third Grade. | | | | | | | | |
| Second set. | 43.7 | 56.3 | 66.9 | 33.1 | 42.2 | 57.8 | 56.9 | 43.1 |
| Fourth set. | 46.2 | 53.8 | 69.6 | 30.4 | 42.1 | 57.9 | 64.1 | 35.9 |
| Average. | 44.9 | 55.1 | 68.3 | 31.7 | 42.2 | 57.8 | 60.5 | 39.5 |
| A Fourth Grade. | | | | | | | | |
| Fourth set. | 44.7 | 55.3 | 51.9 | 48.1 | 43.3 | 56.7 | 56.3 | 43.7 |
| B Fourth Grade. | | | | | | | | |
| Second set. | 44.0 | 56.0 | 61.0 | 39.0 | 42.5 | 57.5 | 49.1 | 50.9 |
| Fourth set. | 43.8 | 56.2 | 67.2 | 32.8 | 38.5 | 61.5 | 63.2 | 36.8 |
| Average. | 43.9 | 56.1 | 64.1 | 35.9 | 40.5 | 59.5 | 56.2 | 43.8 |
| A Fifth Grade. | | | | | | | | |
| Second set. | 37.2 | 62.8 | 50.0 | 50.0 | 41.2 | 58.8 | 60.8 | 39.2 |
| Fourth set. | 47.3 | 52.7 | 48.4 | 51.6 | 43.3 | 56.7 | 62.4 | 37.6 |
| Average. | 42.3 | 57.7 | 49.2 | 50.8 | 42.3 | 57.7 | 61.6 | 38.4 |
| B Fifth Grade. | | | | | | | | |
| Second set. | 38.8 | 61.2 | 62.7 | 37.3 | 40.7 | 59.3 | 57.7 | 42.3 |
| Fourth set. | 42.7 | 57.3 | 50.4 | 49.6 | 36.5 | 63.5 | 55.6 | 44.4 |
| Average. | 40.7 | 59.3 | 56.5 | 43.5 | 38.6 | 61.4 | 56.6 | 43.4 |
| A Sixth Grade. | | | | | | | | |
| Second set. | 46.9 | 53.1 | 65.2 | 34.8 | 43.3 | 56.7 | 58.9 | 41.1 |
| Fourth set. | 42.9 | 57.1 | 69.6 | 30.4 | 51.7 | 48.3 | 57.5 | 42.5 |
| Average. | 44.9 | 55.1 | 67.4 | 32.6 | 47.5 | 52.5 | 58.2 | 41.8 |
| B Sixth Grade. | | | | | | | | |
| Second set. | 41.9 | 58.1 | 67.6 | 32.4 | 45.6 | 54.4 | 79.4 | 20.6 |
| Fourth set. | 40.5 | 59.5 | 50.6 | 49.4 | 41.9 | 58.1 | 70.6 | 29.4 |
| Average. | 41.2 | 58.8 | 59.1 | 40.9 | 43.7 | 56.3 | 75.0 | 25.0 |
| A Seventh Grade. | | | | | | | | |
| Second set. | 41.9 | 58.1 | 61.1 | 38.9 | 40.7 | 59.3 | 45.6 | 54.4 |
| Fourth set. | 39.8 | 60.2 | 59.8 | 40.2 | 38.9 | 61.1 | 54.5 | 45.5 |
| Average. | 40.8 | 59.2 | 60.5 | 39.5 | 39.8 | 60.2 | 50.1 | 49.9 |
| B Seventh Grade. | | | | | | | | |
| Second set. | 45.8 | 54.2 | 67.5 | 32.5 | 48.1 | 51.9 | 55.8 | 44.2 |
| Fourth set. | 49.2 | 50.8 | 44.2 | 55.8 | 41.1 | 58.9 | 58.9 | 41.1 |
| Average. | 47.5 | 52.5 | 55.8 | 44.2 | 44.6 | 55.4 | 57.4 | 42.6 |
| Eighth Grade. | | | | | | | | |
| Second set. | 35.9 | 64.1 | 57.5 | 42.5 | 41.2 | 58.8 | 54.3 | 45.7 |
| Fourth set. | 43.1 | 56.9 | 70.9 | 29.1 | 43.9 | 56.1 | 56.7 | 43.3 |
| Average. | 39.5 | 60.5 | 64.2 | 35.8 | 42.5 | 57.5 | 55.5 | 44.5 |

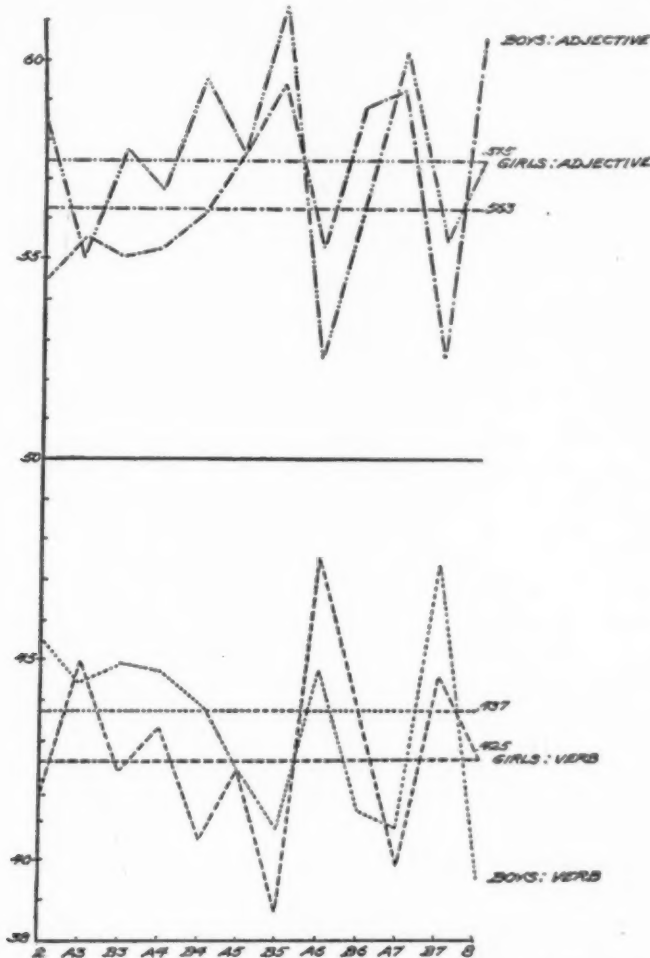


PLATE D. Choice between verbs and adjectives by boys and girls respectively. The ordinates indicate in per cent. the amount of preference shown for each of the two groups of words; the abscissæ, the school-grades. (From Table IV.)

Table II. and Plates B and E show a slight preference among the boys for words denoting activity and not quite so great a preference among the girls for words denoting passivity. The preference for first words is shown in nine grades among the boys and in ten grades among the girls.

Table III. and Plates C and E show a preference for words

pertaining to food among both boys and girls. The preference is more marked among the boys and is shown for all the grades (Plate C); whereas it is shown in ten of the grades among the girls. The greatest difference in the choice of contrasting words is shown here in the result for the boys of the B6 and A7 grades. There is a predominance here of first words in nine grades among the boys and in all grades among the girls.

TABLE V

Showing the total number and percentage of each class of words chosen and also the total number and percentage of first and second words chosen.

| | Time | Space | First | Second | Activ. | Passiv. | First | Second |
|-------------|-------|-------|-------|--------|--------|---------|-------|--------|
| Boys | 3206 | 2743 | 3233 | 2716 | 2812 | 2688 | 2976 | 2524 |
| | 53.9 | 46.1 | 54.3 | 45.7 | 51.1 | 48.9 | 54.1 | 45.9 |
| Girls | 3458 | 3084 | 3562 | 2980 | 3039 | 3153 | 3310 | 2882 |
| | 52.8 | 47.2 | 54.5 | 45.5 | 49.1 | 50.9 | 53.5 | 46.5 |
| | Dress | Food | First | Second | Verb | Adj. | First | Second |
| Boys | 2467 | 3409 | 3336 | 2540 | 2408 | 3100 | 3267 | 2241 |
| | 41.9 | 58.1 | 56.7 | 43.3 | 43.7 | 56.3 | 59.3 | 40.7 |
| Girls | 2942 | 3544 | 3666 | 2820 | 2584 | 3492 | 3614 | 2462 |
| | 45.4 | 54.6 | 56.6 | 43.4 | 42.5 | 57.5 | 59.5 | 40.5 |

Table IV. and Plates D and E show a predominance of adjectives in all the grades among both boys and girls; here the preference is greater among the girls. There is a predominance of first words among the girls in all grades and among the boys in ten grades.

Although Mrs. Manchester's work was upon men and women, nevertheless a comparison of these results with hers is interesting. The element of time was more noticeable among the ideas of men and that of space among the ideas of women. These boys and girls alike show a preference for time ideas—the preference being slightly greater among the boys. The idea of activity was characteristic of the men's lists while that of inactivity appeared in the women's lists. The boys show, on the average, a preference for words denoting activity, although even among them there is in six of the twelve grades a slight predominance of words denoting passivity. Among the girls there is a noticeable preference for words denoting passivity. The men were slightly in advance

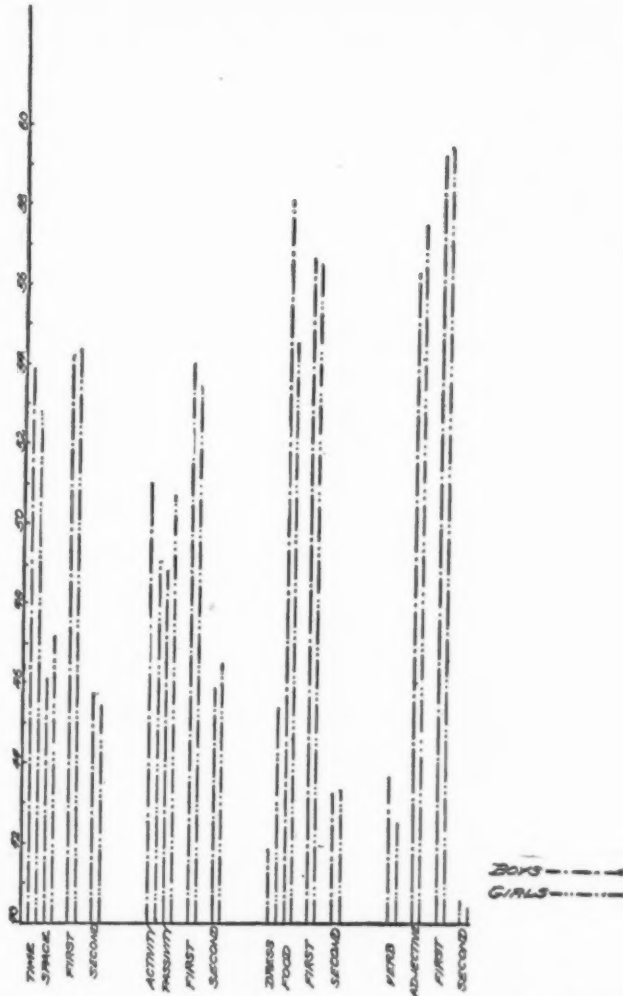


PLATE E. Choice between the various groups of words, and the choice between first and second words when the several groups were offered. (From Table V.)

of the women with reference to food; whereas the women exceeded the men in the class referring to wearing apparel. In this experiment, both boys and girls show a marked preference for words denoting food; the preference is stronger among the boys. The men led in the number of verbs written and the women in the number of adjectives. Both boys and girls show a great preference for adjectives.

The larger problem concerning the difference at various ages in the affective life of boys and girls may be considered in two aspects: (1) What may be inferred from the results of this experiment concerning the problem? (2) How are such inferences related to the conclusions of other investigators?

Considering now the first of these, Plates A to D suggest a tendency toward an increase of preference with age. That this tendency might be more carefully studied, Table VI. was prepared. This table shows in percentages the change of preference based on the different classes of ideas, with age, on the part of the boys and the girls. Table VII. shows the change of preference based on the position of the words, with age, on the part of the boys and the girls. Plate F gives in graphic form the data of Table VI.; and Plate G, the data of Table VII.

Comparing the two plates (F and G), one sees that the preference based upon the position of the words is more pronounced than the preference based upon ideas. This is certainly contrary to the expectations of the writer at the beginning of the experiments. Although one is not surprised to find the pupils in the second and third grades showing a preference for words merely according to their position, one does not look for such purely superficial preference in the upper grades. One's general observation that children grow more thoughtful after nine or ten years of age is upheld by such studies as Mrs. Mary Sheldon Barnes' and Miss Vostrovsky's. Mrs. Barnes¹ has shown that the ability of both boys and girls to make legitimate and critical inferences from an historical incident increases after eight years of age. The increase at first is gradual, then more rapid. Miss Vostrovsky² found an increase with age in definite answers to the question, "Why did you select your last book?" She also found an increase of disbelief in superstitions with age.³

Comparing Plates F and G more closely, one sees that among the girls there are five grades in which the curve for preference based upon ideas rises above 10 per cent.; in four

¹ 'Studies in Historical Method,' Boston, 1896, p. 68.

² 'Study of Children's Superstitions,' Barnes' 'Studies in Education,' Vol. 1, p. 123.

³ 'Children's Reading Tastes,' *Pedagogical Seminary*, Vol. 6, p. 523.

TABLE VI

SHOWING THE CHANGE OF PREFERENCE, IN PER CENT., WITH GRADE¹*List of Time and Space Words*

(With two exceptions, where a preference for Space is indicated by Sp., the preference is for Time words)

| Grade | 2 | A3 | B3 | A4 | B4 | A5 | B5 | A6 | B6 | A7 | B7 | 8 |
|-------------------------|------------------|-----|-----|----------|-----|-----|-----|-----|-----|------|------|-----|
| Boys..... | 3.6 ¹ | 11. | 6.4 | 10.8 | .2 | 5. | 5. | 6. | 3.8 | 15.4 | 6.6 | 12. |
| Girls..... | 1. (Sp.) | 6.4 | 3.4 | 3.8(Sp.) | 5.2 | 3.6 | 11. | 2.6 | .6 | 9.6 | 25.2 | 7. |
| Boys and girls combined | 2.3 | 8.7 | 4.9 | 7.3 | 2.7 | 4.3 | 8. | 4.3 | 2.2 | 12.5 | 15.9 | 9.5 |

List of Words Denoting Activity and Passivity

(Preference is for Activity except where Passivity is indicated by P.)

| | | 3.4 | 4. (P) | 1.8 | .4(P) | .8(P) | 8.4 | 5. | 10.8 | 9. (P) | 3.4(P) | 1.4(P) |
|-------------------------|--------|-----|--------|--------|---------|--------|--------|-----|--------|--------|---------|--------|
| Boys..... | 3.6(P) | 1. | 3.2 | 8. (P) | 20.8(P) | 1.4(P) | 2.8(P) | 0. | 9.2(P) | 4. (P) | 12.2(P) | .6 |
| Girls..... | 6.8 | 2.2 | 4.9 | 4.9 | 10.6 | 1.1 | 5.6 | 2.5 | 10. | 6.5 | 7.8 | 1. |
| Boys and girls combined | 5.2 | | | | | | | | | | | |

List of Words Denoting Dress and Food

(Preference is for Food except where Dress is indicated by D.)

| | | 4 | 3.4 | 17. | 4.8 | 16.2 | 12.2 | 32.6 | 50. | 43.8 | 13.2 | 15.4 |
|-------------------------|------|--------|------|------|-----|------|------|--------|------|------|------|------|
| Boys..... | .8 | 9. (D) | 14.4 | 17.2 | 7.4 | 1.4 | 11. | 8.8(D) | 11. | 38.2 | 5.8 | 7. |
| Girls..... | 11.8 | 4.7 | 8.9 | 17.1 | 6.1 | 8.8 | 11.6 | 20.7 | 30.5 | 41. | 9.5 | 11.2 |
| Boys and girls combined | 6.3 | | | | | | | | | | | |

List of Verbs and Adjectives

(The preferences throughout are for Adjectives)

| | | | | | | | | | | | | |
|-------------------------|------|------|------|------|------|------|------|------|------|------|------|-----|
| Boys..... | 9. | 11.2 | 10.2 | 10.6 | 12.2 | 15.4 | 18.6 | 10.2 | 17.6 | 18.4 | 5. | 21. |
| Girls..... | 16.8 | 10. | 15.6 | 13.4 | 19.5 | 15.4 | 22.8 | 5. | 12.6 | 20.4 | 10.8 | 15. |
| Boys and girls combined | 12.9 | 10.6 | 12.9 | 12. | 15.8 | 15.4 | 20.7 | 7.6 | 15.1 | 19.4 | 7.9 | 18. |

Average Course of Preference; all Lists Combined

| | | 6.5 | 6. | 10.1 | 4.4 | 9.4 | 11.1 | 13.5 | 20.6 | 21.7 | 7.1 | 12.5 |
|-------------------------|-----|-----|-----|------|------|-----|------|------|------|------|------|------|
| Boys..... | 4.3 | 6.6 | 9.2 | 10.6 | 13.3 | 5.5 | 11.9 | 4.1 | 8.4 | 13.1 | 13.5 | 7.4 |
| Girls..... | 9.1 | 6.6 | 7.6 | 10.3 | 8.8 | 7.4 | 11.5 | 8.8 | 14.5 | 17.4 | 10.3 | 9.9 |
| Boys and girls combined | 6.7 | | | | | | | | | | | |

¹Table I. shows that for the boys in the second grade the average selection of time words was 51.8 per cent. of the total number of time and space words presented; the average selection of space words was 48.2 per cent. This indicates a preference of 3.6 per cent. in favor of time words.

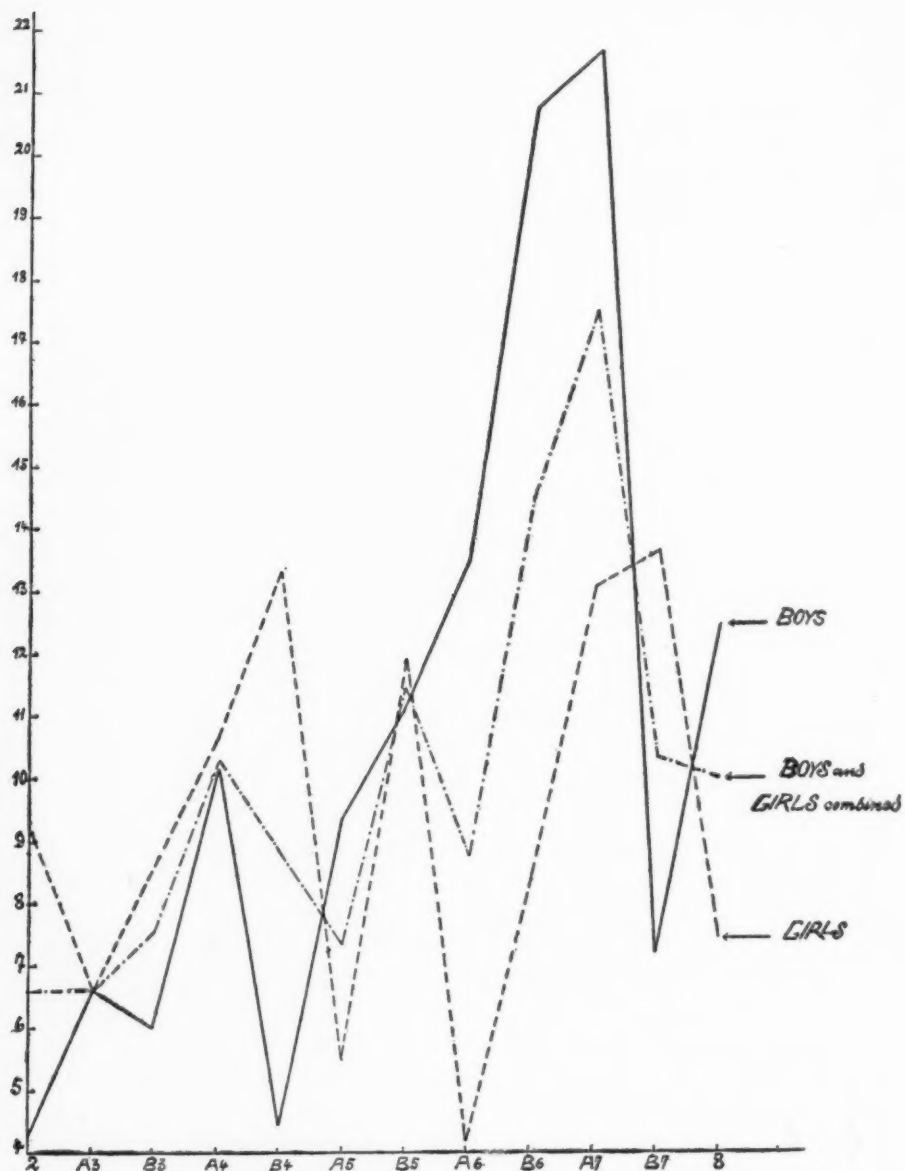


PLATE F. Varying degree of preference arising from difference of the ideas conveyed by the words offered. The ordinates indicate the relative strength of such preference; the abscissæ, the school-grades. (From Table VI.)

TABLE VII

SHOWING, IN PERCENTAGES, THE CHANGE OF PREFERENCE FOR A WORD IN A SPECIAL POSITION

The preference is for first words except where the mark (2) appears

List of Time and Space Words

| Grade | 2 | A3 | B3 | A4 | B4 | A5 | B5 | A6 | B6 | A7 | B7 | 8 |
|------------------------------|--------|------|-----|-----|---------|--------|-----|------|------|------|------|------|
| Boys..... | 3.2(2) | 16.8 | 6.8 | 9.6 | 27.8 | 3.6(2) | 1.4 | 16.2 | 8.8 | 9. | 12.8 | 22.2 |
| Girls..... | 12.6 | 26.8 | 6.4 | 4.8 | 20.4(2) | .2 | 3.6 | 21.8 | 42.2 | 16.2 | 11. | 16.6 |
| Boys and girls combined..... | 7.9 | 21.8 | 6.6 | 7.2 | 24.1 | 1.9 | 2.5 | 19. | 25.5 | 12.6 | 11.9 | 19.4 |

List of Words Denoting Activity and Passivity

| | | | | | | | | | | | | |
|------------------------------|---------|------|-----|-----|--------|--------|--------|--------|------|------|------|------|
| Boys..... | 13. (2) | 12. | 8.6 | 5.8 | 28. | 2. (2) | 3.2(2) | 17.6 | 19.6 | 12. | 22.8 | 23.2 |
| Girls..... | 3.2 | 20.6 | 3.4 | 2. | 2.8(2) | 2.8 | .6 | 4.4(2) | 46.4 | 13. | 9.8 | 23.2 |
| Boys and girls combined..... | 8.1 | 16.3 | 6. | 3.9 | 15.4 | 2.4 | 3.8 | 11. | 33. | 12.5 | 16.3 | 23.2 |

List of Words Denoting Dress and Food

| | | | | | | | | | | | | |
|------------------------------|-------|------|------|------|------|--------|------|------|------|-----|--------|------|
| Boys..... | .2(2) | 13.8 | 18.2 | 16.2 | 18.4 | 3.2(2) | 19.2 | 29.6 | 22.6 | 9.8 | 6.8(2) | 28.8 |
| Girls..... | 7.8 | 24.8 | 11. | 3.6 | 2.4 | 10.2 | 9.4 | 35. | 45. | 1.2 | 7.2 | 12.6 |
| Boys and girls combined..... | 4. | 19.3 | 14.6 | 9.9 | 10.4 | 6.7 | 14.3 | 32.3 | 33.8 | 5.5 | 7. | 20.7 |

List of Verbs and Adjectives

| | | | | | | | | | | | | |
|------------------------------|-------|------|------|------|------|--------|------|------|------|------|------|------|
| Boys..... | .6(2) | 25. | 36.6 | 3.8 | 28.2 | 1.6(2) | 13. | 34.8 | 18.2 | 21. | 11.6 | 28.4 |
| Girls..... | 13.8 | 42.6 | 21. | 12.6 | 12.4 | 23.2 | 13.2 | 16.4 | 50. | .2 | 14.8 | 11. |
| Boys and girls combined..... | 7.2 | 33.8 | 28.8 | 8.2 | 20.3 | 12.4 | 13.1 | 25.6 | 34.1 | 10.6 | 13.2 | 19.7 |

Average Course of Preference for a Word in a Special Position in all Lists Combined

| | | | | | | | | | | | | |
|------------------------------|-----|------|------|-----|------|-----|-----|------|------|------|------|------|
| Boys..... | 4.3 | 16.9 | 17.6 | 8.8 | 25.6 | 2.6 | 9.2 | 24.6 | 17.3 | 12.9 | 13.5 | 25.7 |
| Girls..... | 9.3 | 28.7 | 10.4 | 5.8 | 9.5 | 9.1 | 6.7 | 19.4 | 45.9 | 7.7 | 10.7 | 15.8 |
| Boys and girls combined..... | 6.8 | 22.8 | 14. | 7.3 | 17.6 | 5.9 | 8. | 22. | 31.6 | 10.3 | 12.1 | 20.8 |

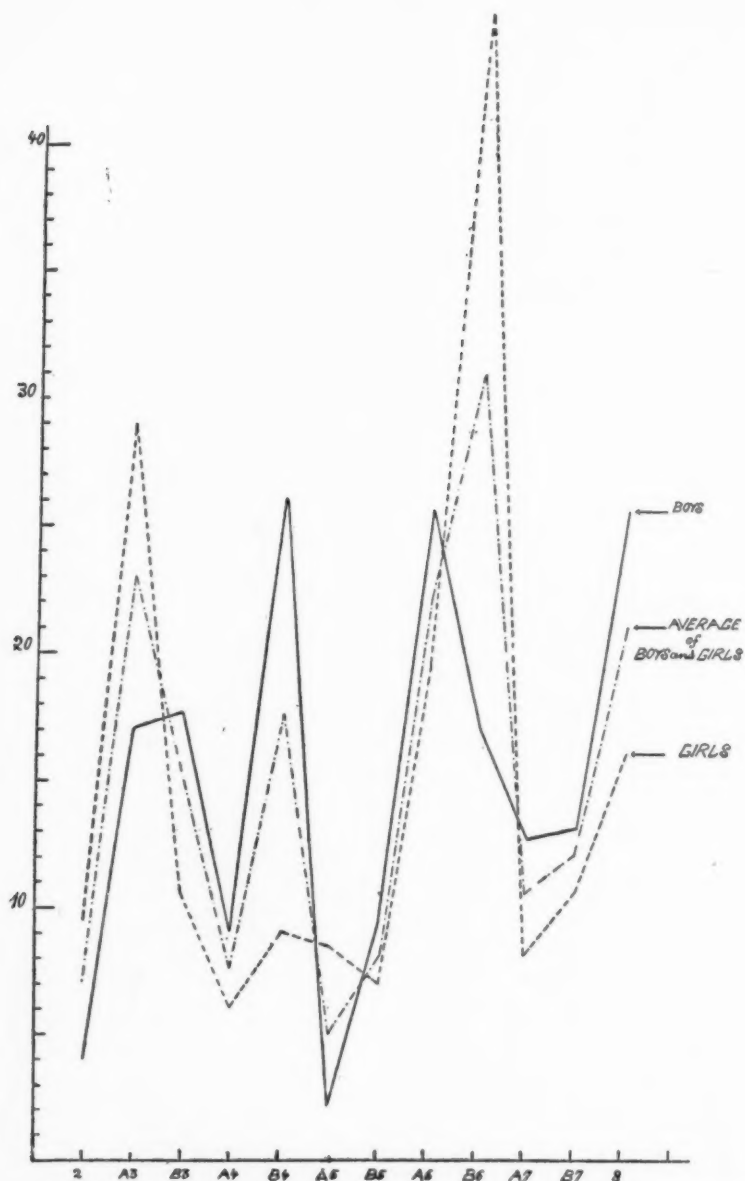


PLATE G. Varying degree of preference arising from mere *position of the word in its pair*. The ordinates indicate the relative strength of such preference; the abscissæ, the school-grades. (From Table VII).

of these grades the curve for preference based upon the order of words is below 10 per cent. There are six grades, in which the curve for preference based upon the order of words is above 10 per cent.; in five of these grades the preference based upon ideas is below 10 per cent. Among the boys, there are six grades in which the curve for preference based upon ideas rises above 10 per cent.; in four of these grades, the curve for preference based upon the order of the words rises above 10 per cent. There are eight grades in which the curve for preference based upon the order of the words rises above 10 per cent.; in five of these grades, the curve for preference based upon ideas rises above ten per cent.

TABLE VIII

SHOWING THE DEGREE OF INTENSITY OF PREFERENCE, IN PER CENT. COMPUTED FROM TABLE V WHICH SHOWS THE AVERAGE PREFERENCE FOR THE TWELVE GRADES

Time and space words.

boys 7.8 in favor of time.
girls 5.6 in favor of time.

Words denoting activity and passivity.

boys 2.2 in favor of activity.
girls 1.8 in favor of passivity.

Words relating to dress and to food.

boys 16.2 in favor of food.
girls 9.2 in favor of food.

Verbs and adjectives.

boys 12.6 in favor of adjectives.
girls 15. in favor of adjectives.

Average preference for first words in all classes of words.

boys 12.2 in favor of first words.
girls 12.05 in favor of first words.

With the double check in the arrangement of the words, described on page 348, one would expect that where the preference for first words is pronounced, there would be a diminished preference for either class of ideas, and vice versa. And yet, to show that the preference for first words may be most apparent in connection with a preference for the idea conveyed by the word, a copy of two lists of words with actual elections is submitted. The A sixth grade boys' lists for words relating to dress and food are selected because Table III shows a marked preference for words relating to food and also for first words.

As was stated previously, these two sets were written some five weeks apart. The number after each word indicates the number of boys who wrote that word. First words are selected 215 times in the 'second set'; of these, 125 relate to food, 90 relate to dress. In the 'fourth set,' first words are selected 238 times; of these, 157 relate to food, 81 relate to dress.

TABLE B

A-SIXTH GRADE: BOYS' ELECTIONS OF WORDS RELATING TO DRESS AND FOOD

| Second Set | Fourth Set | Second Set | Fourth Set |
|-------------|-------------|------------|------------|
| dress 13 | grapes 16 | collar 8 | cheese 15 |
| grapes 4 | dress 2 | cheese 9 | collar 3 |
| nut 12 | cap 11 | banana 12 | ribbon 6 |
| cap 5 | nut 7 | ribbon 5 | banana 12 |
| hat 11 | pie 14 | velvet 7 | apple 17 |
| pie 6 | hat 4 | apple 10 | velvet 1 |
| berries 12 | gloves 10 | supper 14 | cloak 6 |
| gloves 5 | berries 8 | cloak 3 | supper 12 |
| coat 11 | cake 16 | silk 9 | food 14 |
| cake 6 | coat 2 | food 8 | silk 4 |
| bread 12 | skirt 9 | beef 12 | lace 7 |
| skirt 5 | bread 9 | lace 5 | beef 11 |
| vest 8 | meat 16 | taylor 9 | turkey 17 |
| meat 9 | vest 2 | turkey 8 | taylor 1 |
| fruit 11 | shoes 9 | pudding 14 | necktie 8 |
| shoes 5 | fruit 9 | necktie 3 | pudding 10 |
| stockings 8 | potato 15 | button 7 | carrot 17 |
| potato 9 | stockings 3 | carrot 10 | button 1 |
| butter 12 | woolen 9 | dinner 14 | shawl 6 |
| woolen 5 | butter 9 | shawl 3 | dinner 12 |

Since other tabulations show the same results as the one submitted, one may conclude that the first word was given the greater preference when it contained the more attractive idea; when the more attractive idea was second, the preference for the first word either was much reduced or disappeared entirely. Although with the majority of pupils it would appear that the two different kinds of preference—the one based on idea, the other based on mere order of presentation—tended now to reinforce and now to offset each other, yet with certain individuals this is not true; they let themselves be influenced solely by position, writing the first word (or the second word) of the entire list of twenty words. Indeed, several wrote the

first (or second) word of more than one list. The following tabulation throws some light on the influence of this factor in the different grades.

TABLE C
SHOWING SELECTION OF WORDS ACCORDING TO POSITION EXCLUSIVELY

| | Boys | | Girls | |
|----------------------|---------|----------|----------|-----------|
| Second Grade. | | | | |
| First word..... | 5 boys | 9 lists | 5 girls | 16 lists |
| Second word..... | 7 boys | 11 lists | 5 girls | 8 lists |
| A Third Grade..... | | | | |
| First word..... | 5 boys | 10 lists | 7 girls | 9 lists |
| B Third Grade..... | | | | |
| First word..... | 1 boy | 2 lists | 1 girl | 1 list |
| Second word..... | 2 boys | 4 lists | 1 girl | 2 lists |
| A Fourth Grade..... | | | | |
| First word..... | 3 boys | 4 lists | 1 girl | 1 list |
| Second word..... | | | 1 girl | 1 list |
| B Fourth Grade..... | | | | |
| First word..... | 4 boys | 8 lists | | |
| Second word..... | | | 1 girl | 1 list |
| A Fifth Grade..... | | | | |
| First word..... | 2 boys | 2 lists | 2 girls | 2 lists |
| Second word..... | 1 boy | 2 lists | | |
| B Fifth Grade..... | | | | |
| First word..... | | | 1 girl | 2 lists |
| A Sixth Grade..... | | | | |
| First word..... | 7 boys | 17 lists | 7 girls | 10 lists |
| Second word..... | | | 5 girls | 8 lists |
| B Sixth Grade..... | | | | |
| First word..... | 1 boy | 2 lists | 4 girls | 13 lists |
| Second word..... | | | 1 girl | 2 lists |
| A Seventh Grade..... | | | | |
| First word..... | 2 boys | 4 lists | 3 girls | 6 lists |
| B Seventh Grade..... | | | | |
| First word..... | 1 boy | 2 lists | | |
| Eighth Grade..... | | | | |
| First word..... | 1 boy | 2 lists | 6 girls | 12 lists |
| Second word..... | | | 3 girls | 8 lists |
| Total..... | 42 boys | 79 lists | 54 girls | 102 lists |

Table C attracts one's attention to three points:

1. The influence of the factor of the position of the word is more frequent in the lowest two grades, as is to be expected. The excessive breaking out in the A sixth grade is puzzling; yet among the girls, the preference for the first word and for the second word tend to balance. In the eighth grade, one might suspect a conspiracy among the girls, since nine out of ten girls are influenced by the order of presentation. However, it seems improbable that any plan of writing the words

could have been prearranged, as the pupils did not know when the words were to be presented. In fact, they were rather led to think that each presentation was the last.

2. Table C shows that a certain order was followed in one hundred and two lists among the girls and in seventy-nine lists among the boys—giving this factor a greater frequency among the girls in the ratio of 10 to 8. This frequency among the girls is still more pronounced, even when one allows for the greater number of girls' papers. There were 648 girls' lists of twenty words and 600 boys' lists of twenty words—or a ratio of about 16 to 15.

3. This tabulation runs parallel at certain points with the general preference based on the position of the words shown in Table VII. In Table C, in the second grade, the preferences for the first word and for the second word are almost balanced among boys and girls. In Table VII. there is a comparatively small percentage of preference for the position of the word shown in this grade. In the A and B fifth grades, Table C shows little influence of this factor of the position of the word; in Table VII. the percentage of preference is low. In the A sixth grade, one would expect the preference for the first word to more or less balance the preference for the second word among the girls (Table C). But Table VII. shows a marked preference for first words. However, among the boys in that grade the two tables are parallel. The girls of the eighth grade are greatly influenced by this factor of the position of the words (Table C), and there is also a marked preference shown in Table VII. Yet Table VII. gives a high percentage of preference for the position of a word for the boys of the eighth grade while Table C shows almost no influence of this factor. However, the small number of boys in this grade must be considered.

With reference to the first aspect of the larger problem; namely, what inferences may be drawn from this experiment concerning the differences in the affective life of boys and girls of various ages, the results warrant the statement that there is with age, a general, though very irregular, increase in the preference shown for the various classes of ideas.

Furthermore, the preference is more marked among the boys than among the girls. The irregularities of the curves of Plate F may be due to several reasons. At least eight nationalities are represented in these children, and in some of the homes the parents do not speak English. And with a greater number of children the curve would tend to be more regular; 150 boys and 162 girls are the basis for these curves.

It is also noticeable that in some of the grades the children are over age. Ayers¹ gives the following as the normal age:

| | | | | | | | |
|------------|-----|------|------|-------|-------|-------|-------|
| Grade..... | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Age..... | 7-9 | 8-10 | 9-11 | 10-12 | 11-13 | 12-14 | 13-15 |

The following (to repeat from Table A, p. 348) are the average ages of the pupils in the present experiment:

| Grade | 2 | A3 | B3 | A4 | B4 | A5 |
|-------------------|------|------|------|------|------|------|
| Age of boys..... | 9.3 | 10.1 | 10.9 | 10.9 | 12.4 | 11.3 |
| Age of girls..... | 8.6 | 9.3 | 9.3 | 11. | 11.7 | 12.1 |
| Grade | B5 | A6 | B6 | A7 | B7 | 8 |
| Age of boys..... | 13.9 | 13.3 | 13.6 | 13.6 | 14.5 | 15.1 |
| Age of girls..... | 12.1 | 12.9 | 14. | 12.9 | 14. | 14.8 |

The table for the normal age is given for the grade; *i. e.*, for the sixth grade, the normal age is from 11 to 13. Any pupil in the sixth grade who is over 13 years of age is beyond the normal age. Or, any pupil in the A sixth grade who is over 12 years of age is beyond the normal age. Glancing at Table A, one finds that the boys in the B3, B4, B5, A6, B6 and B7 grades are beyond the normal age; the girls in the A3, A4, B4, A5, A6 and B6 grades are beyond the normal age.

After studying the irregularities in the curves in Plate F, one finds that in the grades in which the drops occur the pupils are over age. In the boys' curve, the points are the B3, B4 and B7 grades; in the girls' curve, the A3, A5 and A6 grades. Yet, the boys of the B5, A6 and B6 grades are also above the normal age and at these points the curve is steadily rising. The girls of the A4 and B6 grades are also above the normal age and the curve is rising at these points. In the B4 grade, in which the girls are beyond the normal age, their curve has reached one of the peaks.

¹ 'Laggards in Our Schools,' 1909, p. 38.

Considering the second aspect of the larger problem, these curves would have been more comparable with the curves of other studies if the age of the pupils instead of the grades had been used as the basis for the curves. However, some rough comparisons may be of interest. In a 'Study of Children's Reading Tastes' by Miss Vostrovsky,¹ curves are given which show the increase, with age, in definiteness of answer to the question "Why did you select your last book?" The curves show that the boys increase gradually in definiteness with no drops, whereas the girls' increase is not so great nor so steady. There are two drops in the girls' curve—at ten and at fifteen years of age—and a sudden rise from fourteen to fifteen. She infers from the results that boys are more independent in their selection of books than are girls.

In a 'Study of Children's Superstitions'² by the same writer, a growth in the critical spirit as children become older is shown. The curves showing the number of superstitions described as untrue by boys and by girls display the same differences between boys and girls as was mentioned in her other study. About the same general difference between boys and girls is shown in Plate F as was shown in Miss Vostrovsky's studies.

In Donaldson's³ showing of the variation in brain weight during the first twenty-five years, the curves for both boys and girls are far more regular than in my Plate F, and yet there are some points of similarity. From eleven to thirteen years of age, the boys' curves show a steady rise both in the preferences here studied and also in brain weight; then a drop in both to fourteen and then a rise in both to fifteen. Among the girls, there is a decided rise in both from thirteen to fourteen, then a drop in both. Fourteen years is the highest point in both. There is far less similarity between these curves of Plate F and the two curves which Donaldson⁴ gives of the changes (A) in the length of the head and (B) in the breadth of the head.

¹ *Pedagogical Seminary*, Vol. 6, p. 523.

² In Barnes' 'Studies in Education,' Vol. I, p. 123.

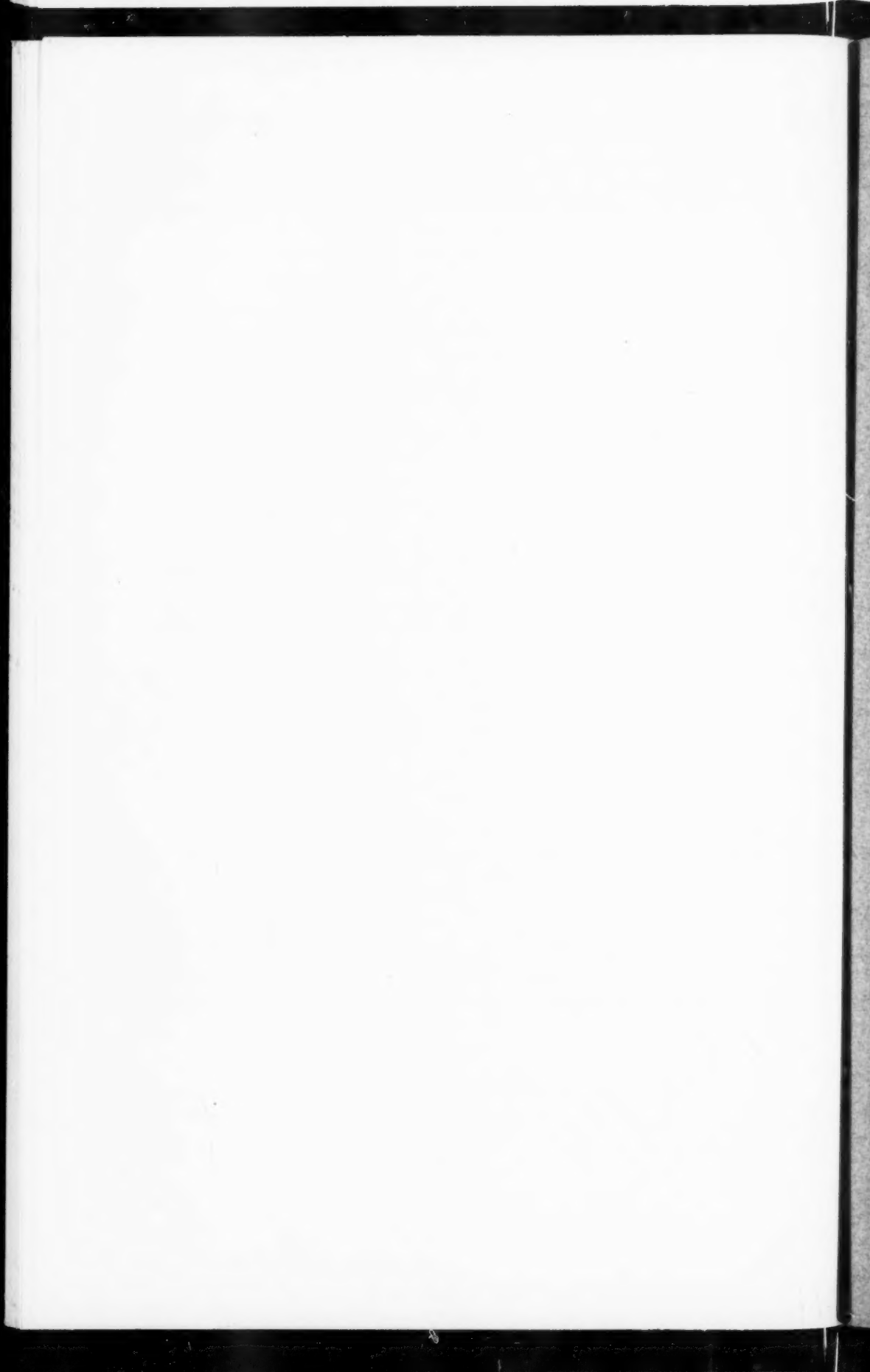
³ 'Growth of the Brain,' 1895, p. 105.

⁴ 'Growth of the Brain,' 1895, p. 112.

Important curves for comparison are those given by Burk in a study on the 'Growth of Children in Height and Weight.'¹ Two of these sets of curves give the annual percentage of increase in weight (I. J.) and the annual percentage of increase in height (K. L.) of the average American girl and boy. There are several points of similarity between his curves I. J. and my own F. The girls' curves drop from eight to nine years in both; and twelve years, the highest point in I. J., is one of the three peaks in F. However, there is a steady rise from nine to twelve in I. J.; whereas in F. there is a drop and then a rise before twelve years is reached. The boys' curves I. J. and K. L. are similar from nine to fifteen years. There is a drop from ten to eleven in these, comparable to that from A₃ (10 yrs.) to B₃ (11 yrs.) in F. But, in the curves I. J. and K. L., there is a steady rise from eleven to fifteen, the highest point; whereas in F, there is a drop from A₄ (11 yrs.) to B₄ (12 yrs.) followed by a rise to A₇ (13.6 yrs.), the highest point; then another drop and another rise.

It is thus probable that there is some connection between general physical and mental growth and the development of the affective life, of which preference is an aspect.

¹ *The American Journal of Psychology*, Vol. 9 (1897-98), p. 263.



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